Online Appendix

Incentivized Peer Referrals for Tuberculosis Screening: Evidence from India

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A Conceptual Framework

This framework fixes ideas about how incentives affect current patients' expected benefits of making referrals, and provides a formal description of the margins of effort through which current patients can influence the behavior of their contacts. Referrals can be used to overcome imperfect information when individuals have private knowledge that may be obtained from and shared through their social networks. The best-known examples are in labor markets, where current employees may have better information than firms about the characteristics of prospective new workers (Bryan et al., 2010; Heath, 2018; Kugler, 2003; Beaman and Magruder, 2012; Beaman et al., 2018; Burks et al., 2015; Friebel et al., 2018).

The conceptual framework that guides our experimental design is grounded in our focus on the choices of existing patients, who face potential costs and benefits from referring others for TB screening. The framework is based on Beaman and Magruder (2012), who applied it to the more traditional context of job referrals. The framework fixes ideas about how incentives affect current patients' expected benefits of making referrals, and provides a formal description of the margins of effort through which current patients can influence the behavior of their contacts. It provides high-level motivation for considering the interaction of incentives and outreach modality.

We assume that each existing patient EP_i undergoing TB treatment at a certain health care provider is endowed with a given number of contacts $j = 1, ..., n_i$. From the perspective of EP_i, the individual making the referral, each of his contacts j is a potential subject of the referral and is characterized by:

1. A net benefit d_{ij} that EP_i receives when referring contact j to the provider,[34] defined as d_{ij} = g_{ij} - s_{ij} - c_{ij}, where g_{ij} is the value of any utility generated by the interaction (such as the "warm glow" described by Andreoni (1990) that EP_i might experience from knowing he helped contact j improve her health), s_{ij} denotes any disutility of the interaction due to the stigma and discrimination associated with TB, and c_{ij} is the time and effort cost of identifying, interacting with, and providing contact j with information about TB, screening opportunities, etc. Thus, the net benefit d_{ij} can be positive or negative, depending on whether its positive or negative components prevail.

2. A fixed payment from a third party, f_i, received for referring contact j, if j presents for TB screening, irrespective of the test results.

3. A contingent payment from the third party, p_i, received only if contact j tests positive for TB. Implicitly, p_i is conditional on j getting screened and tested, and testing positive.

4. The subjective probability π_j that contact j has TB, as assessed by EP_i after observing signals such as whether j presents symptoms consistent with the disease.

5. The probability $\lambda_{ij}(X_j,q_{ij})$ that contact j will present for screening, which is a function of j's characteristics, X_j, as well as q_{ij}, the quality of information that is available to j about the costs and benefits of screening and treatment, which can be influenced by her interactions with EP_i.

An individual EP_i will make a referral if his net expected benefit from the referral is positive; that is, if:

$$d_{ij} + \lambda_{ij}(f_i + \pi_j \times p_i) > 0 \tag{4}$$

[34]In our framework, existing patients consider a single prospective referral at a time. They do not consider tradeoffs between referring different contacts, which we operationalize by explicitly allowing an unlimited number of referrals. Although this set-up is realistic in our context (as we show below, the modal number of names provided and referrals made by each patient, conditional on giving any names or making any referrals at all, is one), allowing existing patients to consider multiple referrals at the same time could have different implications.

Due to lack of awareness of the social benefits of making referrals, and possibly because of the stigma associated with TB (Kelly, 1999; Atre et al., 2011), the net reward d_{ij} for making a referral is likely to be small or negative. This would explain why, in the absence of other incentives, referrals in this context are rare—in contrast to the job referral context, where the social reward for a referral is typically positive.[35]

Motivated by this simple framework, our experiment includes manipulations of payments to EPs as well as outreach modalities varying EPs' involvement in the referral process. Our experiment includes an "encouragement" condition without any financial incentives; this increases the salience of the social importance of testing anyone with TB symptoms and therefore, the perceived positive component of d_{ij}; this might motivate the existing patient to identify potential targets as well as exert effort to improve q_{ij}, thereby increasing the probability that person j presents to get screened. We also included payments to the referrer, which may be entirely fixed ($f_i > 0$ and $p_i = 0$) or depend on the prospective patient's TB test results ($p_i > 0$).[36] Knowing that their contact is receiving an incentive (conditional or unconditional) might also provide suspects j with social cover for seeking screening, which might counteract the stigma s_{ij} associated with visiting the health center (Thornton (2008) made this argument in the context of incentivized HIV testing and learning the test results).

When the reward is fixed, the incentive for referring contacts depends only on their willingness to be screened for TB, and not directly on whether they have symptoms consistent with TB. If a person's willingness to get screened and tested (λ_{ij}) increases with π_j, the likelihood of having the disease, then existing patients have private incentives to target referrals to contacts most likely to be infected even under a system of fixed payments only. However, existing patients and their contacts could behave strategically

[35] In other health applications, financial incentives have been used to overcome pecuniary and non-pecuniary costs of behavioral change (Baird et al., 2012; Kohler and Thornton, 2011; Walque et al., 2012; Thornton, 2008; Kremer et al., 2009; Miller et al., 2012; Basing et al., 2011).

[36] As we describe later in more detail, we calibrate the payment structure in our experiment such that the total expected value of third-party payments for a new referral is the same for existing patients assigned to pure fixed-payment incentives or to a combination of a fixed payment plus a contingent reward. Equalizing expected payments allows us to remove income effects and isolate the incentive effect of the different incentive schemes.

to take advantage of fixed payments. The introduction of contingent payments allows us to determine the extent of such opportunistic behavior. When contingent payment is introduced, EP_i's expected payment depends directly on his information about a contact's characteristics, and EP_i has stronger incentives to make use of his knowledge about his contact's health. Therefore, the probability that any prospective patient actually has TB is greater when that individual is referred by an existing patient eligible for contingent payments p_i, rather than by an existing patient eligible for a fixed payment f_i of equal expected value.

Referrals can be operationalized in one of two ways. The first involves personal contact between EP_i and j. Alternatively, EP_i could provide contact information for j to a third party, such as a health worker. The health worker could either reveal EP_i's identity as the impetus for the contact or conceal it. These strategies vary in their implications for q_{ij}, the quality of information received by j, and s_{ij} and c_{ij}, the social and effort cost to EP_i of referring j. Direct conversation between EP_i and j can transmit both objective (symptoms of TB, location of testing center and health care provider, duration of regimen, etc.) and subjective (personal experience with health workers, experience with side effects of medication, etc.) information. That information may carry additional weight because of the preexisting relationship between EP_i and j. In contrast, outreach by a health worker transmits objective information but not the subjective experience of a personal contact. The perceived quality of the information conveyed by the health worker may be enhanced when the health worker indicates to j that she visits at the behest of EP_i. Whether the ultimate quality of information received by j is higher or lower for outreach by existing patients or health workers depends on the weight j places on subjective versus objective information and on the effectiveness and accuracy of (and effort exerted by) existing patients relative to health care workers in communicating about TB screening. If prospective TB patients value subjective information highly or trust their contacts substantially more than they trust health workers, then outreach by existing patients could raise q_{ij} by more than outreach by health workers, making it more likely that the prospective patient presents for screening.

Variation in whether outreach is conducted by existing patients or health workers

also manipulates c_{ij} and s_{ij}, the economic and social costs to EP_i of referring j. While personal contact between EP_i and j may facilitate the exchange of information about the benefits of treatment, EP_i incurs time costs for the interaction, which may increase in the quality of information conveyed. Peer outreach also potentially reveals EP_i's status as a TB patient to j and therefore increases EP_i's social costs. If, instead, a health worker reaches out to j and conceals EP_i's identity, this removes the stigma cost term s_{ij} but does not necessarily affect the positive component of d_{ij} because EP_i may still enjoy the "warm glow" of having helped someone (and is free to personally tell j of the referral if he so chooses). Thus, if stigma is an important deterrent to referrals, then we expect more referrals in experimental conditions that conceal the existing patient's identity. If the intensity of peer outreach increases q_{ij}, then peer referral should be more effective when peers are incentivized to exert more effort and provide high-quality information.

The predictions we have discussed thus far relate to how changes in the value of fixed and contingent third-party payments affect the probability that an existing patient i refers a social contact j for TB screening. We now consider two additional implications of our framework and experimental design. The first regards the characteristics of the social contacts $j = 1, ..., n_i$ who are referred for TB screening. While current TB patients likely face lower outreach costs than health workers because the patients regularly interact with people who share their TB risk factors, their contacts vary in vulnerability and marginalization. On one hand, more vulnerable individuals may be more likely to have TB but less likely to have access to information about testing and treatment. On the other, social costs associated with referring a more vulnerable or marginalized contact may be higher because of lower social reward or higher time cost for the interaction. Therefore, both types of incentives may change the composition of referred contacts by increasing the chance that vulnerable individuals are identified.

While this framework characterizes the mechanisms through which existing patients' effort can affect referrals and how effort is affected by incentives, it also illustrates the difficulty of distinguishing between margins of effort: either increasing q_{ij} or choosing contacts with higher values of π_j raises the expected benefit to the current patient,

and does so as a linear function of the contingent payment. The model also illustrates the challenges of separating the costs associated with potentially revealing one's own TB status from any benefits such revelation may have in increasing λ_{ij}, the probability that a contact gets screened. Rather than derive predictions from the model, we use it to map the experimental treatments to the current patients' choice problem, and to provide intuition for the mechanisms through which outreach modality and incentives affect current patients' expected benefits from making referrals.

B Heterogenous effects of treatment

We revert to to separate specifications for incentive type and outreach type, and focus on five characteristics that potentially predict differential responses: asset ownership, social connection, delay in seeking treatment for TB symptoms, phase of treatment, and gender. Having demonstrated equal effects of conditional and unconditional incentives, and health worker outreach on behalf of identified and anonymous peers, respectively, we pool across treatment conditions.

Existing patients with higher asset levels are likely to enjoy higher levels of consumption and to have higher opportunity cost of time. Wealthier existing patients may be less responsive to incentives because the payments represent a smaller fraction of consumption. Wealthier patients may also be less effective when tasked with peer referrals because of their higher opportunity cost of time.

Existing patients who are more socially connected (measured by their number of contacts in the previous 24 hours) may face lower costs (lower c_{ij}) for each referral, predicting both more referrals on average and possibly a stronger response to financial incentives.[37] The lower c_{ij} may also give these highly connected patients an advantage over less connected patients in making peer referrals.

Existing patients who seek treatment quickly may receive a higher social benefit (s_{ij})

[37]Our measure of social connectedness should be interpreted as an indication of opportunities for social interaction, not necessarily as a measure of the size of an individual's network. In fact, low-income individuals who live in highly crowded urban areas may have many interactions that do not generate "social capital" that confers material benefits.

because of their own motivation or the perceived intrinsic value of making a referral. These patients may also be more effective in convincing peers to seek testing and treatment; this information can improve q_{ij} only if it is conveyed directly in the peer-outreach treatment but not indirectly in the health worker outreach arms. Therefore, we expect more referrals from existing patients assigned to the encouragement group who quickly seek treatment for their own symptoms, but we have no clear prediction for the response to financial incentives. We also expect these early treatment seekers to be more effective in referring new suspects than are existing patients who delay their own care. The early treatment seekers may also make more referrals in health worker outreach arms, but only through naming more contacts and not through communicating their own experiences.

Existing patients in the intensive phase (again, IP) of treatment have realized fewer benefits of treatment than those in the continuation phase (again, CP). They are more likely to experience side effects from the higher doses of medication they take and they are required to take observed doses more frequently than those in the CP. Therefore, they may bear higher costs of conducting outreach (higher c_{ij}), leading to predictions opposite those for patients with many social contacts: fewer referrals on average, a weaker response to financial incentives, and less willingness to make peer referrals. The patients in the intensive phase have also reaped fewer benefits from treatment, so they may be less effective in communicating its benefits.

Finally, we consider heterogeneity by gender. This analysis is standard in public health and in studies of India, a highly gendered society. It is particularly relevant in the context of our study, because in at least some of the communities where we worked, women's movement outside the household is strictly limited and social relationships are strictly gendered: men socialize with men, and women socialize with women. This means that women may have lower ability to make peer referrals and that new suspects they refer (who are disproportionately likely to be women themselves) may be less likely to report for screening.

To test these predictions, we create indicators for above-median asset ownership, connection, starting TB treatment without delay, and for being in the IP of treatment,

respectively,[38] as well as for being female. We then estimate interacted versions of equations (1) and (2), pooling conditional and unconditional incentives and identified and anonymous health worker outreach treatments, respectively. The specification for the tests of incentives is:

$$\begin{aligned} y_{ijc} = \alpha &+ \delta_0 \text{Above median} + \delta_1 \text{Encouragement}_{jc} + \delta_2 \text{Financial incentive}_{jc} \\ &+ \delta_3 \text{Above median} \times \text{Encouragement}_{jc} + \delta_4 \text{Above median} \times \text{Financial incentive}_{jc} \\ &+ \Gamma_c + \epsilon_j \end{aligned} \tag{5}$$

and the specification for the test of outreach strategies is:

$$\begin{aligned} y_{ijc} = \alpha &+ \theta_0 \text{Above median} + \theta_1 \text{Peer}_{jc} + \theta_2 \text{Health worker}_{jc} \\ &+ \theta_3 \text{Above median} \times \text{Peer}_{jc} + \theta_4 \text{Above median} \times \text{Health worker}_{jc} \\ &+ \Gamma_c + \epsilon_j \end{aligned} \tag{6}$$

Note that while we use the notation "above median" for convenience, the relevant indicator is coded as 1 for female patients and for those in the IP, respectively, in the specifications that consider those dimensions of heterogeneity. Because of statistical power considerations and to reduce the number of reported outcomes, we estimate these equations for only one outcome: the number of screened patients (corresponding to the outcome in column 1 of Tables 2 and 3).

We begin with Table B21, which estimates equation (5). As predicted, and shown in column 1, when assigned to the encouragement treatment, high-asset existing patients made somewhat fewer referrals than existing patients with below-median assets. While highly socially connected existing patients made more referrals on average, they did not respond differentially to the financial incentives. In the encouragement arm, existing patients who began their own TB treatment without delay made more referrals than

[38]The IP lasts for the first two months of treatment and the CP for months three through six. However, many patients require more than six months to complete treatment due to missed doses or other considerations. We set the indicator for intensive treatment equal to 1 for patients in the first two months of treatment and 0 for those in months 3–24. The indicator is coded as missing for the less than 1% of patients who reported that they started treatment more than 24 months before the survey.

those who delayed seeking treatment, and they referred 0.037 more suspects than those who delayed their own treatment. There is no clear pattern of differential response based on treatment phase. Finally, women did not make fewer referrals on average or respond differently to financial incentives than men.

Table B22 reports results for estimates of equation (6). While this specification confirms that highly connected patients make marginally more referrals (column 2), there is almost no evidence of differential effectiveness across the outreach modalities. In most cases, the interaction effects are precisely estimated zeros. The statistical significance of the outreach strategies, the magnitudes of the coefficients, and the pattern that peer outreach generates approximately twice as many referrals as either of the health worker outreach strategies are similar to those in Table 3.

Appendix Tables (For online publication only)

Table B1: Testing whether attrition was associated with experimental condition

	Y = 1 if the patient was surveyed, 0 otherwise	
	(1)	(2)
Encouragement	-0.023	
	(0.030)	
Unconditional incentive	-0.005	
	(0.029)	
Conditional incentive	-0.025	
	(0.030)	
Peer outreach		-0.016
		(0.031)
Health worker outreach, identified		-0.038
		(0.029)
Health worker outreach, anonymous		0.005
		(0.028)
Observations	4,203	4,203
R-squared	0.029	0.030

Linear models estimated by OLS, including city fixed effects. The dependent variable is equal to 1 if the existing patient was surveyed, and 0 otherwise. Standard errors are clustered at the center level. The sample includes all baseline patients. The omitted category is patients in pure control clinics.

Table B2: Testing whether the size of OpASHA centers was associated with experimental condition

	Y = Number of original patients in a center	
	(1)	(2)
Encouragement	6.467	
	(4.922)	
Unconditional incentive	7.219	
	(5.129)	
Conditional incentive	7.078	
	(4.595)	
Peer outreach		5.321
		(4.842)
Health worker outreach, identified		8.102
		(4.982)
Health worker outreach, anonymous		7.633
		(4.803)
Observations	122	122
R-squared	0.520	0.523

Linear models estimated by OLS, including city fixed effects. The dependent variable is the number of original patients in each center. Robust standard errors are in parentheses. The sample includes all 122 OpASHA centers in the study.

Table B3: Summary statistics (means and standard deviations), by incentive type

	Control	Encouragement	Condit. incentive	Uncondit. incentive	All
Female respondent	0.413	0.403	0.390	0.406	0.401
	(0.494)	(0.491)	(0.488)	(0.491)	(0.490)
Hindu respondent	0.831	0.813	0.826	0.823	0.821
	(0.376)	(0.391)	(0.379)	(0.382)	(0.383)
Muslim respondent	0.153	0.153	0.128	0.150	0.145
	(0.361)	(0.360)	(0.334)	(0.358)	(0.352)
Respondent has some literacy	0.688	0.703	0.668	0.700	0.690
	(0.465)	(0.457)	(0.471)	(0.458)	(0.462)
Respondent has secondary education	0.307	0.288	0.294	0.311	0.298
	(0.462)	(0.453)	(0.456)	(0.463)	(0.458)
Asset index	0.289	0.055	0.000	(0.081)	0.008
	(1.714)	(1.881)	(1.718)	(1.696)	(1.765)
Respondent has bank account	0.640	0.633	0.588	0.613	0.613
	(0.481)	(0.482)	(0.492)	(0.487)	(0.487)
Number of social contacts	3.087	2.249	2.650	2.654	2.554
	(5.752)	(4.254)	(6.309)	(6.456)	(5.772)
Previously treated for TB	0.159	0.185	0.173	0.166	0.174
	(0.366)	(0.389)	(0.378)	(0.372)	(0.379)
Tested within 1 month of symptoms	0.878	0.794	0.852	0.816	0.824
	(0.329)	(0.405)	(0.355)	(0.388)	(0.381)
Observations	189	992	971	1024	3176

Table B4: Summary statistics (means and standard deviations), by outreach type

	Control	Peer outreach	health-worker outreach (identified)	health-worker outreach (anonymous)	All
Female respondent	0.413	0.414	0.412	0.371	0.401
	(0.494)	(0.493)	(0.492)	(0.483)	(0.490)
Hindu respondent	0.831	0.830	0.821	0.810	0.821
	(0.376)	(0.375)	(0.384)	(0.393)	(0.383)
Muslim respondent	0.153	0.142	0.132	0.160	0.145
	(0.361)	(0.349)	(0.339)	(0.367)	(0.352)
Respondent has some literacy	0.688	0.674	0.713	0.681	0.690
	(0.465)	(0.469)	(0.452)	(0.466)	(0.462)
Respondent has secondary education	0.307	0.284	0.321	0.285	0.298
	(0.462)	(0.451)	(0.467)	(0.452)	(0.458)
Asset index	0.289	(0.088)	0.080	(0.034)	0.008
	(1.714)	(1.735)	(1.814)	(1.741)	(1.765)
Respondent has bank account	0.640	0.595	0.611	0.630	0.613
	(0.481)	(0.491)	(0.488)	(0.483)	(0.487)
Number of social contacts	3.087	2.575	2.545	2.432	2.554
	(5.752)	(5.756)	(6.074)	(5.409)	(5.772)
Previously treated for TB	0.159	0.163	0.189	0.170	0.174
	(0.366)	(0.370)	(0.392)	(0.375)	(0.379)
Tested within 1 month of symptoms	0.878	0.811	0.825	0.825	0.824
	(0.329)	(0.392)	(0.380)	(0.380)	(0.381)
Observations	189	973	1088	926	3176

Table B5: P-values for pairwise omnibus balance tests

	Control	Unconditional incentive	Conditional incentive
Encouragement	0.108	0.390	0.001
Unconditional incentive	0.237		0.120
Conditional incentive	0.512		

	Control	Identified health worker outreach	Anonymous health worker outreach
Peer outreach	0.386	0.025	0.613
Health worker outreach, identified	0.167		0.183
Health worker outreach, anonymous	0.475		

Each cell reports the p-value of the F-test that the coefficients on the variables listed in Table B3 are jointly zero, in an LPM specification where the sample includes respondents in the respective pairs of treatment conditions, and the outcome is a binary for assignment to one of the treatment conditions instead of the other. Each specification includes city fixed effects.

Table B6: Number of referrals named by existing patients

	Peer outreach	
N. names given	**No incentive**	**Incentive**
None	345 (95.57%)	565 (92.32%)
1 name	13 (3.6%)	36 (5.88%)
2 names	3 (0.83%)	7 (1.14%)
3 names	0 (0%)	2 (0.33%)
4 names	0 (0%)	0 (0%)
5 names	0 (0%)	2 (0.33%)
6 names	0 (0%)	0 (0%)
Total	19	66
Per patient	0.05	0.11

	Health worker outreach	
N. names given	**No incentive**	**Incentive**
None	561 (88.91%)	1226 (88.65%)
1 name	41 (6.5%)	91 (6.58%)
2 names	20 (3.17%)	32 (2.31%)
3 names	6 (0.95%)	15 (1.08%)
4 names	2 (0.32%)	9 (0.65%)
5 names	0 (0%)	7 (0.51%)
6 names	1 (0.16%)	3 (0.22%)
Total	113	289
Per patient	0.18	0.21

Note: Distribution of existing patients according to the number of names given to the enumerators, by experimental condition.

Table B7: Number of returned cards, by experimental condition (peer outreach only)

Panel A

	(1)
Dep. var. = number of cards returned	
Unconditional incentive	0.280
	(0.305)
Conditional incentive	0.235
	(0.316)
Observations	869
R-squared	0.043
Mean in no-incentive group	7.24

Linear model estimated by OLS, including city fixed effects. The dependent variable is the number of cards returned by the patient at endline. Standard errors clustered by center are in parentheses. The sample includes patients in the peer outreach arms only.

Panel B

Number of cards returned	(1) No incentive	(2) Unconditional incentive	(3) Conditional incentive
0	73 (23.1%)	47 (20.43%)	75 (23.22%)
1	3 (0.95%)	2 (0.87%)	1 (0.31%)
2	4 (1.27%)	1 (0.43%)	4 (1.24%)
3	0 (0%)	2 (0.87%)	1 (0.31%)
4	1 (0.32%)	2 (0.87%)	5 (1.55%)
5	3 (0.95%)	3 (1.3%)	4 (1.24%)
6	2 (0.63%)	4 (1.74%)	2 (0.62%)
7	5 (1.58%)	10 (4.35%)	6 (1.86%)
8	7 (2.22%)	9 (3.91%)	10 (3.1%)
9	25 (7.91%)	24 (10.43%)	20 (6.19%)
10	193 (61.08%)	126 (54.78%)	195 (60.37%)
Per-patient average	7.24	7.29	7.17

Table B8: Effects of financial incentives on TB screening, testing, and detection (including baseline covariates)

	(1) Patients screened	(2) Tests recommended	(3) Patients tested	(4) Positive tests
Encouragement	0.043	0.031	0.026	0.003
	(0.017)	(0.014)	(0.014)	(0.003)
Unconditional incentive	0.093	0.078	0.055	0.009
	(0.025)	(0.020)	(0.014)	(0.004)
Conditional incentive	0.091	0.073	0.056	0.004
	(0.029)	(0.024)	(0.020)	(0.004)
Observations	3031	3031	3031	3031
R-squared	0.02	0.02	0.02	0.02
Mean of dep. var. in control group	0.00	0.00	0.00	0.00
P-value: treatments jointly 0	0.001	0.001	0.003	0.099
Point estimates of differences between treatment arms (SEs in parentheses):				
Encouragement-Unconditional	0.049	0.046	0.029	0.007
	(0.024)	(0.019)	(0.013)	(0.005)
Encouragement-Conditional	0.048	0.042	0.030	0.001
	(0.030)	(0.026)	(0.019)	(0.005)
Conditional-Unconditional	-0.001	-0.005	0.001	-0.005
	(0.031)	(0.025)	(0.016)	(0.005)

Linear models estimated by OLS, including city fixed effects. Standard errors are clustered at the center level. The sample includes all existing patients. The omitted category is patients in pure control clinics. Includes all covariates from Table B3.

Table B9: Effects of outreach strategies on TB screening, testing, and detection (including baseline covariates)

	(1) Patients screened	(2) Tests recommended	(3) Patients tested	(4) Positive tests
Peer outreach	0.115	0.090	0.058	0.008
	(0.030)	(0.024)	(0.017)	(0.003)
Health worker outreach, identified	0.049	0.037	0.031	0.001
	(0.016)	(0.013)	(0.013)	(0.003)
Health worker outreach, anonymous	0.059	0.052	0.046	0.006
	(0.020)	(0.018)	(0.017)	(0.004)
Observations	3031	3031	3031	3031
R-squared	0.02	0.02	0.02	0.02
Mean of dep. var. in control group	0.00	0.00	0.00	0.00
P-value: treatments jointly 0	0.001	0.001	0.005	0.042
Point estimates of differences between treatment arms (SEs in parentheses):				
Peer-Identified	0.067	0.053	0.027	0.007
	(0.027)	(0.022)	(0.013)	(0.004)
Peer-Anonymous	0.057	0.038	0.012	0.002
	(0.030)	(0.026)	(0.018)	(0.005)
Anonymous-Identified	0.010	0.014	0.016	0.005
	(0.017)	(0.015)	(0.013)	(0.006)

Linear models estimated by OLS, including city fixed effects. Standard errors are clustered at the center level. The sample includes all existing patients. The omitted category is patients in pure control clinics. Includes all covariates from Table B3.

Table B10: Complementarities between peer outreach and financial incentives on TB screening, testing and detection (including baseline covariates)

	(1) Patients screened	(2) Tests recommended	(3) Patients tested	(4) Positive tests
Peer outreach, no financial incentive	0.033	0.023	0.018	-0.002
	(0.022)	(0.020)	(0.015)	(0.002)
Health worker outreach, no financial incentive	0.048	0.035	0.030	0.005
	(0.019)	(0.016)	(0.016)	(0.004)
Peer outreach, financial incentive	0.167	0.132	0.083	0.015
	(0.043)	(0.034)	(0.023)	(0.004)
Health worker outreach, financial incentive	0.060	0.052	0.044	0.003
	(0.018)	(0.016)	(0.015)	(0.003)
Observations	3176	3176	3176	3176
R-squared	0.02	0.02	0.02	0.02
Mean of dep. var. in control group	0.00	0.00	0.00	0.00
Point estimate of differences between treatment arms (p-values in parentheses):				
Peer incentives - Peer encouragement	0.134	0.109	0.065	0.017
	(0.007)	(0.007)	(0.012)	(0.001)
Health worker outreach incentives - Health worker outreach encouragement	0.025	0.017	0.014	-0.002
	(0.498)	(0.307)	(0. 343)	(0.750)
Peer encouragement - Health worker outreach encouragement	-0.015	-0.012	-0.012	-0.007
	(0.519)	(0.555)	(0.457)	(0.110)
Peer incentives - Health worker outreach incentives	0.107	0.080	0.039	0.012
	(0.007)	(0.013)	(0.054)	(0.017)

Linear models estimated by OLS, including city fixed effects. Standard errors are clustered at the center level.
The sample includes all existing patients. The omitted category is patients in pure control clinics. Regressions include all covariates from Table B3.

Table B11: Effects of financial incentives on TB screening, testing, and detection (covariates selected by double lasso)

	(1) Patients screened	(2) Tests recommended	(3) Patients tested	(4) Positive tests
Encouragement	0.019	0.016	0.012	0.003
	(0.011)	(0.008)	(0.007)	(0.003)
Unconditional incentive	0.060	0.055	0.038	0.012
	(0.014)	(0.012)	(0.009)	(0.004)
Conditional incentive	0.078	0.064	0.046	0.006
	(0.022)	(0.019)	(0.015)	(0.005)
Observations	3176	3176	3176	3176
N. of controls	3067	3067	3067	3067
N. of selected controls	42	39	34	22
Mean of dep. var. in control group	0.00	0.00	0.00	0.00
P-value: treatments jointly 0	0.00	0.00	0.00	0.01
Point estimates of differences between treatment arms:				
Encouragement-Unconditional	0.041	0.039	0.026	0.010
	(0.015)	(0.013)	(0.010)	(0.005)
Encouragement-Conditional	0.059	0.048	0.034	0.004
	(0.025)	(0.022)	(0.017)	(0.006)
Conditional-Unconditional	0.018	0.008	0.008	-0.006
	(0.023)	(0.019)	(0.015)	(0.007)

Linear models estimated by OLS, including city fixed effects. Standard errors are clustered at the center level. The sample includes all existing patients. The omitted category is patients in pure control clinics. Covariates selected by the double-lasso procedure described by Belloni et al. (2014) and implemented in Stata 16 using the command pdslasso, a user-written command provided by Ahrens et al. (2018).

Table B12: Effects of outreach strategies on TB screening, testing, and detection (covariates selected by double lasso)

	(1) Patients screened	(2) Tests recommended	(3) Patients tested	(4) Positive tests
Peer outreach	0.103	0.078	0.047	0.010
	(0.021)	(0.016)	(0.012)	(0.004)
Identified contact tracing	0.021	0.022	0.017	0.002
	(0.010)	(0.008)	(0.007)	(0.003)
Anonymous contact tracing	0.007	0.013	0.011	-0.001
	(0.010)	(0.009)	(0.008)	(0.005)
Observations	3176	3176	3176	3176
N. of controls	3067	3067	3067	3067
N. of selected controls	47	37	79	27
Mean of dep. var. in control group	0.00	0.00	0.00	0.00
P-value: treatments jointly 0	0.00	0.00	0.00	0.08
Point estimates of differences between treatment arms:				
Peer-Identified	0.083	0.056	0.029	0.007
	(0.021)	(0.016)	(0.012)	(0.005)
Peer-Anonymous	0.097	0.065	0.035	0.011
	(0.022)	(0.017)	(0.013)	(0.006)
Anonymous-Identified	-0.014	-0.009	-0.006	-0.003
	(0.011)	(0.011)	(0.010)	(0.006)

Linear models estimated by OLS, including city fixed effects. Standard errors are clustered at the center level. The sample includes all existing patients. The omitted category is patients in pure control clinics. Covariates selected by the double-lasso procedure described by Belloni et al. (2014) and implemented in Stata 16 using the command pdslasso, a user-written command provided by Ahrens et al. (2018).

Table B13: Complementarities between peer outreach and financial incentives on TB screening, testing and detection (covariates selected by double lasso)

	(1) Patients screened	(2) Tests recommended	(3) Patients tested	(4) Positive tests
Peer outreach, no financial incentive	0.029	0.014	0.008	-0.000
	(0.018)	(0.016)	(0.012)	(0.004)
Contact tracing, no financial incentive	0.023	0.014	0.013	0.003
	(0.011)	(0.009)	(0.008)	(0.004)
Peer outreach, financial incentive	0.156	0.117	0.073	0.018
	(0.035)	(0.030)	(0.022)	(0.007)
Contact tracing, financial incentive	0.021	0.021	0.019	0.003
	(0.010)	(0.009)	(0.007)	(0.003)
Observations	3176	3176	3176	3176
N. of controls	3067	3067	3067	3067
N. of selected controls	47	50	55	42
Mean of dep. var. in control group	0.00	0.00	0.00	0.00
Point estimate of differences between treatment arms (p-values in parentheses):				
Peer incentives - Peer encouragement	0.127	0.103	0.065	0.018
	(0.00)	(0.01)	(0.02)	(0.05)
Health worker outreach incentives - Health worker outreach encouragement	-0.002	-0.002	0.006	0.000
	(0.87)	(0.50)	(0.49)	(0.97)
Peer encouragement - Health worker outreach encouragement	0.006	0.000	-0.005	-0.003
	(0.74)	(1.00)	(0.74)	(0.47)
Peer incentives - Health worker outreach incentives	0.135	0.105	0.054	0.015
	(0.00)	(0.00)	(0.01)	(0.04)

Linear models estimated by OLS, including city fixed effects. Standard errors are clustered at the center level.
The sample includes all existing patients. The omitted category is patients in pure control clinics.
Covariates selected by the double-lasso procedure described by Belloni et al. (2014) and implemented in Stata 16 using the command pdslasso, a user-written command provided by Ahrens et al. (2018).

Table B14: Effects of financial incentives on TB screening, testing, and detection (weighted regressions)

	(1) Patients screened	(2) Tests recommended	(3) Patients tested	(4) Positive tests
Encouragement	0.046	0.034	0.029	0.005
	(0.021)	(0.017)	(0.016)	(0.004)
Unconditional incentive	0.090	0.075	0.053	0.011
	(0.029)	(0.024)	(0.017)	(0.006)
Conditional incentive	0.100	0.075	0.054	0.005
	(0.029)	(0.024)	(0.019)	(0.005)
Observations	3176	3176	3176	3176
R-squared	0.01	0.01	0.02	0.02
Mean of dep. var. in control group	0.001	0.00	0.00	0.00
P-value: treatments jointly 0	0.00	0.00	0.00	0.13
Point estimates of differences between treatment arms:				
Encouragement-Unconditional	0.044	0.041	0.025	0.006
	(0.029)	(0.025)	(0.015)	(0.006)
Encouragement-Conditional	0.055	0.041	0.025	0.000
	(0.032)	(0.028)	(0.019)	(0.007)
Conditional-Unconditional	0.011	0.000	0.000	-0.006
	(0.035)	(0.030)	(0.016)	(0.007)

Linear models estimated by OLS, including city fixed effects and weighting each observation by the the inverse of the number of original patients per center. Standard errors are clustered at the center level. The sample includes all current patients. The omitted category is patients in pure control clinics.

Table B15: Effects of outreach strategies on TB screening, testing, and detection (weighted regressions)

	(1) Patients screened	(2) Tests recommended	(3) Patients tested	(4) Positive tests
Peer outreach	0.134	0.103	0.062	0.010
	(0.029)	(0.024)	(0.017)	(0.004)
Health worker outreach, identified	0.047	0.034	0.032	0.003
	(0.020)	(0.016)	(0.015)	(0.004)
Health worker outreach, anonymous	0.057	0.050	0.044	0.008
	(0.020)	(0.018)	(0.018)	(0.006)
Observations	3176	3176	3176	3176
R-squared	0.02	0.02	0.02	0.02
Mean of dep. var. in control group	0.00	0.00	0.00	0.00
P-value: treatments jointly 0	0.00	0.00	0.00	0.05
Point estimates of differences between treatment arms:				
Peer-Identified	0.087	0.069	0.030	0.007
	(0.026)	(0.023)	(0.012)	(0.005)
Peer-Anonymous	0.077	0.052	0.018	0.002
	(0.027)	(0.024)	(0.015)	(0.006)
Anonymous-Identified	0.010	0.016	0.012	0.005
	(0.015)	(0.014)	(0.011)	(0.007)

Linear models estimated by OLS, including city fixed effects and weighting each observation by the the inverse of the number of original patients per center. Standard errors are clustered at the center level. The sample includes all current patients. The omitted category is patients in pure control clinics.

Table B16: Complementarities between peer outreach and financial incentives on TB detection (weighted regressions)

	(1) Patients screened	(2) Tests recommended	(3) Patients tested	(4) Positive tests
Peer outreach, no financial incentive	0.030	0.022	0.018	-0.001
	(0.030)	(0.026)	(0.021)	(0.005)
Health worker outreach, no financial incentive	0.054	0.040	0.034	0.008
	(0.022)	(0.018)	(0.017)	(0.005)
Peer outreach, financial incentive	0.194	0.149	0.087	0.016
	(0.037)	(0.032)	(0.022)	(0.006)
Health worker outreach, financial incentive	0.062	0.051	0.043	0.006
	(0.019)	(0.016)	(0.016)	(0.005)
Observations	3176	3176	3176	3176
R-squared	0.03	0.02	0.02	0.02
Mean of dep. var. in control group	0.00	0.00	0.00	0.00
Point estimate of differences between treatment arms (p-values in parentheses):				
Peer incentives - Peer encouragement	0.164	0.127	0.069	0.015
	(0.002)	(0.007)	(0.025)	(0.043)
Health worker outreach incentives - Health worker outreach encouragement	0.008	0.011	0.009	-0.002
	(0.636)	(0.486)	(0.517)	(0.780)
Peer encouragement - Health worker outreach encouragement	-0.024	-0.018	-0.016	-0.007
	(0.442)	(0.524)	(0.417)	(0.202)
Peer incentives - Health worker outreach incentives	0.132	0.098	0.044	0.010
	(0.001)	(0.001)	(0.009)	(0.062)

Linear models estimated by OLS, including city fixed effects and weighting each observation by the the inverse of the number of original patients per center. Health worker outreach includes both identified and anonymous health worker outreach. Financial incentives includes both conditional and unconditional incentives. Standard errors are clustered at the center level. The sample includes all current patients. The omitted category is patients in pure control clinics.

Table B17: Effects of financial incentives on TB screening, testing, and detection (center-level specification)

	(1) Patients screened	(2) Tests recommended	(3) Patients tested	(4) Positive tests
Encouragement	0.048	0.032	0.024	0.003
	(0.018)	(0.016)	(0.015)	(0.004)
Unconditional incentive	0.101	0.087	0.057	0.015
	(0.025)	(0.023)	(0.016)	(0.007)
Conditional incentive	0.103	0.082	0.063	0.009
	(0.037)	(0.034)	(0.025)	(0.007)
Observations	122	122	122	122
R-squared	0.14	0.15	0.21	0.28
Mean of dep. var. in control group	0.00	0.00	0.00	0.00
P-value: treatments jointly 0	0.001	0.002	0.003	0.13
Point estimates of differences between treatment arms:				
Encouragement-Unconditional	0.053	0.055	0.032	0.012
	(0.024)	(0.040)	(0.014)	(0.006)
Encouragement-Conditional	0.055	0.050	0.038	0.006
	(0.037)	(0.033)	(0.024)	(0.006)
Conditional-Unconditional	-0.002	0.005	-0.005	0.006
	(0.040)	(0.036)	(0.024)	(0.009)

Linear models estimated by OLS, including city fixed effects. The unit of analysis is the center. Outcomes are averages of existing patient-level outcomes within clinic. The omitted category is pure control clinics. Regressions include the center-level baseline number of patients as control. Robust standard errors are in parentheses.

Table B18: Effects of outreach strategies on TB screening, testing, and detection (center-level specification)

	(1) Patients screened	(2) Tests recommended	(3) Patients tested	(4) Positive tests
Peer outreach	0.123	0.093	0.057	0.014
	(0.033)	(0.030)	(0.020)	(0.006)
Health worker outreach, identified	0.056	0.047	0.037	0.006
	(0.017)	(0.017)	(0.016)	(0.005)
Health worker outreach, anonymous	0.059	0.052	0.046	0.005
	(0.020)	(0.020)	(0.019)	(0.004)
Observations	122	122	122	122
R-squared	0.15	0.14	0.18	0.28
Mean of dep. var. in control group	0.00	0.00	0.00	0.00
P-value: treatments jointly 0	0.001	0.004	0.016	0.18
Point estimates of differences between treatment arms:				
Peer-Identified	0.067	0.046	0.020	0.007
	(0.032)	(0.028)	(0.019)	(0.007)
Peer-Anonymous	0.063	0.041	0.011	0.009
	(0.035)	(0.032)	(0.022)	(0.006)
Anonymous-Identified	-0.002	- 0.005	-0.008	0.001
	(0.020)	(0.019)	(0.018)	(0.007)

Linear models estimated by OLS, including city fixed effects. The unit of analysis is the center. Outcomes are averages of existing patient-level outcomes within clinic. The omitted category is pure control clinics. Regressions include the center-level baseline number of patients as control. Robust standard errors are in parentheses.

Table B19: Complementarities between peer outreach and financial incentives on TB screening, testing, and detection (center-level specification)

	(1) Patients screened	(2) Tests recommended	(3) Patients tested	(4) Positive tests
Peer outreach, no financial incentive	0.041	0.024	0.018	0.001
	(0.022)	(0.018)	(0.015)	(0.004)
Health worker outreach, no financial incentive	0.049	0.035	0.027	0.003
	(0.021)	(0.019)	(0.018)	(0.004)
Peer outreach, financial incentive	0.165	0.129	0.078	0.020
	(0.047)	(0.042)	(0.028)	(0.008)
Health worker outreach, financial incentive	0.062	0.057	0.048	0.007
	(0.018)	(0.018)	(0.017)	(0.005)
Observations	122	122	122	122
R-squared	0.22	0.20	0.20	0.30
Mean of dep. var. in control group	0.00	0.00	0.00	0.00
P-value: treatments jointly 0	0.001	0.006	0.015	0.015
Point estimate of differences between treatment arms (SEs in parentheses):				
Peer incentives - Peer encouragement	0.124	0.105	0.061	0.018
	(0.051)	(0.045)	(0.029)	(0.009)
Health worker outreach incentives - Health worker outreach encouragement	0.013	0.022	0.020	0.003
	(0.021)	(0.019)	(0.018)	(0.005)
Peer encouragement - Health worker outreach encouragement	-0.007	-0.011	-0.010	-0.002
	(0.024)	(0.020)	(0.017)	(0.004)
Peer incentives - Health worker outreach incentives	0.104	0.072	0.029	0.013
	(0.046)	(0.042)	(0.009)	(0.009)

Linear models estimated by OLS, including city fixed effects. The unit of analysis is the center. Outcomes are averages of existing patient-level outcomes within clinic. The omitted category is pure control clinics. Regressions include the center-level baseline number of patients as control. Robust standard errors are in parentheses.

Table B20: New patients enrolled at Operation ASHA clinics (center-level data)

	(1)	(2)	(3)	(4)
	new patients enrolled / baseline patients			
Any treatment	0.124			
	(0.283)			
Encouragement		0.139		
		(0.305)		
Financial incentive		0.116		
		(0.291)		
Peer outreach			0.303	
			(0.298)	
Health worker outreach			0.006	
			(0.288)	
Peer outreach, no financial incentive				0.296
				(0.352)
Health worker outreach, no financial incentive				0.035
				(0.322)
Peer outreach, financial incentive				0.307
				(0.316)
Health worker outreach, financial incentive				-0.010
				(0.300)
Observations	122	122	122	122
R-squared	0.10	0.10	0.13	0.13
Mean of dep. var. in control group	0.44	0.44	0.44	0.44

Linear models estimated by OLS, including city fixed effects. The unit of analysis is the center. The outcome variable is the number of new patients enrolled at Operation ASHA clinics during the study period divided by the baseline number of patients at the start of the study period. The omitted category is pure control clinics. Regressions include the center-level baseline number of patients as control. Standard errors are in parentheses.

Table B21: Heterogeneous effects of financial incentives on the number of referrals

	(1)	(2)	(3)	(4)	(5)
Outcome:	**Patients screened**				
Heterogeneity by:	Asset ownership	Social contacts	No treatment delay	Intensive phase	Female
Above median	-0.001	0.023	-0.007	0.004	-0.001
	(0.006)	(0.012)	(0.013)	(0.007)	(0.014)
Encouragement	0.060	0.064	0.014	0.046	0.040
	(0.021)	(0.023)	(0.024)	(0.022)	(0.018)
Financial incentive	0.102	0.095	0.104	0.097	0.102
	(0.024)	(0.022)	(0.030)	(0.027)	(0.024)
Above median * Encouragement	-0.033	-0.034	0.037	-0.005	0.012
	(0.020)	(0.023)	(0.017)	(0.019)	(0.026)
Above median * Financial incentive	-0.012	0.005	-0.006	0.004	-0.015
	(0.023)	(0.019)	(0.037)	(0.028)	(0.035)
Observations	3174	3046	3167	3176	3047
R-squared	0.01	0.01	0.01	0.01	0.01

Linear models estimated by OLS, including city fixed effects. Standard errors are clustered at the center level. The sample includes all existing patients. The omitted category is patients in pure control clinics. "Above median" is an indicator set to 1 for patients with above-median asset scores (column 1); above-median social contacts (column 2); who did not delay seeking treatment for their own TB symptoms (column 3); in the first two months of treatment (column 5); and who are female (column 6).

Table B22: Heterogeneous effects of outreach strategies on the number of referrals

	(1)	(2)	(3)	(4)	(5)
Outcome:			**Patients screened**		
Heterogeneity by:	Asset ownership	Social contacts	No treatment delay	Intensive phase	Female
Above median	-0.002	0.021	-0.007	0.005	0.001
	(0.005)	(0.012)	(0.013)	(0.006)	(0.013)
Peer outreach	0.125	0.117	0.078	0.120	0.126
	(0.029)	(0.030)	(0.039)	(0.038)	(0.034)
Health worker outreach	0.062	0.064	0.060	0.058	0.055
	(0.019)	(0.018)	(0.027)	(0.017)	(0.016)
Above median * Peer	-0.013	0.012	0.057	0.010	-0.005
	(0.042)	(0.037)	(0.054)	(0.049)	(0.066)
Above median * Health worker	-0.015	-0.015	-0.007	-0.008	-0.012
	(0.015)	(0.016)	(0.023)	(0.015)	(0.021)
Observations	3174	3046	3167	3176	3047
R-squared	0.02	0.02	0.02	0.02	0.01

Linear models estimated by OLS, including city fixed effects. Standard errors are clustered at the center level. The sample includes all existing patients. The omitted category is patients in pure control clinics. "Above median" is an indicator set to 1 for patients with above-median asset scores (column 1); above-median social contacts (column 2); who did not delay seeking treatment for their own TB symptoms (column 3); in the first two months of treatment (column 5); and who are female (column 6).

Table B23: Comparison of existing patients and new symptomatics

	(1) Current patients	(2) New symptomatics	(3) Difference	(4) P-value (1) = (2)
Female respondent	0.401	0.366	0.035	0.368
	(0.009)	(0.037)	(0.038)	
Respondent has some literacy	0.690	0.448	0.243	0.000
	(0.008)	(0.038)	(0.036)	
Asset Index	0.008	-0.144	0.152	0.269
	(0.031)	(0.124)	(0.138)	
Number of social contacts	2.554	1.413	1.141	0.010
	(0.105)	(0.266)	(0.445)	
Observations	3176	172	3348	

Table B24: Effects of financial incentives on characteristics of referred patients

	(1) Female	(2) Some literacy	(3) Asset index	(4) Social contacts
Financial incentive	-0.007	0.022	-0.676	-0.208
	(0.087)	(0.85)	(0.305)	(0.553)
Observations	172	172	172	172
R-squared	0.12	0.15	0.18	0.07
Mean of dep. var. in encouragement group	0.37	0.49	0.21	1.37

Linear models estimated by OLS, including city fixed effects. Standard errors are clustered at the center level. The sample includes new patients who were screened because of a referral. The omitted category is new patients referred under the encouragement condition.

Table B25: Effects of outreach type on characteristics of referred patients

	(1) Female	(2) Some literacy	(3) Asset index	(4) Social contacts
Peer outreach	0.096	-0.174	-0.269	-1.772
	(0.097)	(0.102)	(0.370)	(0.873)
Observations	172	172	172	172
R-squared	0.13	0.17	0.16	0.11
Mean of dep. var. in health worker outreach groups	0.34	0.55	0.04	2.12

Linear models estimated by OLS, including city fixed effects. Standard errors are clustered at the center level. The sample includes new patients who were screened because of a referral. The omitted category is new patients referred via health worker outreach.

Table B26: Cost of detection: reduced-cost scenario

Panel A: Costs by Incentive Type

	Encouragement		Conditional		Unconditional	
	Cost per current patient	Total cost	Cost per current patient	Total cost	Cost per current patient	Total cost
Incentive payments	n/a	n/a	11	10500	12	12600
Referral card printing	16	15440	16	15440	11	11416
Training of existing patients	14	13542	14	13542	13	13542
Payments to health workers	69	68400	70	68400	67	68400
Total cost		97382		107882		105958
Cost per symptomatic screened		2375		1160		1292
Cost per TB case detected		13912		8990		6622
Cost per symptomatic screened ($US)		37		18		20
Cost per TB case detected ($US)		214		138		102

Panel B: Costs by Outreach Type

	Peer		Health worker, identified		Health worker, anonymous	
	Cost per current patient	Total cost	Cost per current patient	Total cost	Cost per current patient	Total cost
Incentive payments	13	12400	5	5300	6	5400
Referral card printing	40	38920	1	1408	2	1968
Training of existing patients	14	13542	12	13542	15	13542
Payments to health workers	n/a	n/a	94	102600	111	102600
Total cost		64862		122850		123510
Cost per symptomatic screened		554		2559		2422
Cost per TB case detected		4633		13650		10292
Cost per symptomatic screened ($US)		9		39		37
Cost per TB case detected ($US)		71		210		158

This scenario assumes distribution of 5 cards instead of 10 and reduces health worker stipends by 50% to Rs. 900/month.
Panel A: Estimated number of detections correspond to outcome variables in Table 2, columns 1 and 7.
Panel B: Estimated number of detections correspond to outcome variables in Table 3, columns 1 and 7.
All costs in Indian rupees, except where indicated. Exchange rate is Rs. 65 to $US 1.