Community Mobilization for HIV Testing Uptake: Results From a Community Randomized Trial of a Theory-Based Intervention in Rural South Africa

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Background: HIV testing uptake in South Africa is below optimal levels. Community mobilization (CM) may increase and sustain demand for HIV testing, however, little rigorous evidence exists regarding the effect of CM interventions on HIV testing and the mechanisms of action.

Methods: We implemented a theory-driven CM intervention in 11 of 22 randomly-selected villages in rural Mpumalanga Province. Cross-sectional surveys including a community mobilization measure were conducted before (n = 1181) and after (n = 1175) a 2-year intervention (2012–2014). We assessed community-level intervention effects on reported HIV testing using multilevel logistic models. We used structural equation models to explore individual-level effects, specifically whether intervention assignment and individual intervention exposure were associated with HIV testing through community mobilization.

Results: Reported testing increased equally in both control and intervention sites: the intervention effect was null in primary analyses. However, the hypothesized pathway, CM, was associated with higher HIV testing in the intervention communities. Every standard deviation increase in village CM score was associated with increased odds of reported HIV testing in intervention village participants (odds ratio: 2.6, $P = <0.001$) but not control village participants (odds ratio: 1.2, $P = 0.53$). Structural equation models demonstrate that the intervention affected HIV testing uptake through the individual intervention exposure received and higher personal mobilization scores.

Conclusions: There was no evidence of community-wide gains in HIV testing due to the intervention. However, a significant intervention effect on HIV testing was noted in residents who were personally exposed to the intervention and who evidenced higher community mobilization. Research is needed to understand whether CM interventions can be diffused within communities over time.

Key Words: community mobilization, HIV testing, critical consciousness, social cohesion, South Africa

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BACKGROUND

HIV transmission can be decreased substantially by reducing the proportion of people with undiagnosed infections and expanding early and consistent use of antiretroviral therapy.[1–3] To achieve this goal, access to HIV testing and HIV care must be expanded and communities must embrace HIV testing and care services. To date, HIV testing uptake in sub-Saharan Africa is far below needed levels for early detection and treatment to optimally impact prevention. National data from South Africa in 2012 indicated that although 65% of the population reported ever testing for HIV, 40% in the last year, only 38% of HIV-positive men and 55% of HIV-positive women were aware of their HIV status.[4] Reaching the United Nations Programme on HIV/AIDS goals of 90-90-90, that is ensuring that 90% of all people living with HIV know their HIV status, 90% of all people with diagnosed HIV infection receive sustained antiretroviral therapy, and 90% of all people receiving antiretroviral therapy achieve viral suppression, hinges on testing uptake, the gateway into care.[5]

Interventions that increase uptake and frequency of HIV testing are urgently needed, particularly those that address social and structural barriers to testing and care, including HIV-related stigma and fear of disclosure; gender norms that discourage men and women from engaging in care; and a general lack of community awareness and buy in around the benefits of early testing and treatment.[6] Tackling social barriers to HIV prevention, testing, linkage, and care requires building a sustained community response.[7] Community mobilizing approaches (CMA) that focus on building community resources and support for normative changes needed to promote HIV prevention and community health may fuel demand for HIV testing services while modifying social and structural barriers to care. CMAs typically encompass aspects of health communication and advocacy, but also move beyond outreach and messaging to build dialogue, community connections, resources and skills, and promote human rights and collective action.[8–10] Although few community-level mobilizing interventions targeting HIV testing have been implemented, one multi-site trial demonstrated drastic improvements in HIV testing through a large community-based testing initiative accompanied by community awareness campaigns and partnership building.[11,12] CMAs that focus on enabling social environments, such as forging equitable gender norms or creating social cohesion have also demonstrated improvements in consistent condom use[7,8,13–21] and reductions in partner violence.[22,23]

To date, few CMAs in the field of HIV prevention, testing, and care have been driven by an explicit, a priori theoretical model of community change. Specifically, there has been little work to unpack the key constructs and mechanisms through which these CMAs might impact health outcomes. We built a theory-based community mobilization (CM) intervention focused on raising consciousness and community action around the intersection of HIV and gender norms, with a focus on young men (18–35). We implemented the CMA in 11 randomly selected communities (from 22) within a health and socio-demographic surveillance site (HDSS) in Mpumalanga, South Africa to determine whether the intervention would change gender norms, change sexual behavior, and increase HIV testing uptake. This manuscript focuses on the program's secondary outcome, HIV testing uptake, and specifically evaluates the pathways through which the intervention was hypothesized to operate, that is through the domains of CM, and examines effects at both the community and individual levels.

METHODS

Research Site

The study villages are located within the Agincourt subdistrict of Bushbuckridge in rural Mpumalanga province, where low education levels and high unemployment rates lead to extensive temporary labor migration.[24] Villages in the area were initially established during the apartheid government's forced removal programs in the 1940s, however, over time, residents in these villages have come to strongly identify the village name, residents, and village boundaries as their "community," which was confirmed during qualitative research undertaken before the intervention.[10]

The Medical Research Council/Wits University Rural Public Health and Health Transitions Research Unit (Agincourt) runs the health and socio-demographic surveillance system (HDSS) established in 1992 in this area. Through an annual HDSS census, the unit maintains a detailed longitudinal database and sampling frame, including geo-coding, of all 16,000 households in the area.[25] HIV prevalence in the area was over 45% among 35–39 year olds in 2010–2011,[26] making this area one of the highest prevalence regions in the country.[4]

Intervention Description

The intervention was carried out in partnership with Sonke Gender Justice, a South African nongovernmental organization, based on their One Man Can campaign (OMC) and adapted to fit our a priori conceptual CM model. Based on a synthesis of social science literature and qualitative research described elsewhere,[10] we identified 6 domains of mobilization that we hypothesize must be addressed for successfully impact HIV prevention: (1) a shared concern that is the target of change; (2) building of critical consciousness; (3) an organizational structure with links to groups/networks; (4) leadership (individual and/or institutional); (5) collective activities/actions; and (6) social cohesion. OMC mobilization teams carried out a variety of programming that mapped onto our CM framework, including community-based activities and workshops as well as establishing community action teams (CATs) and engaging with local leadership. Activities aimed to open dialogue, forge community discussion, and encourage action around a set of thematic areas. Thematic areas included Gender, power and health; Gender and violence; Gender & HIV/AIDS, Alcohol; Healthy relationships; and Human rights. Overall, each activity focused on a process target (at least one CM domain) and a thematic area, with a strong emphasis on engaging men to question traditional norms related to violence, relationships, alcohol, and engagement with health care. Discussions around male engagement in health care, and specifically in HIV testing uptake, were emphasized in activities and workshops, including commitments to test and to encourage others to test.

Example intervention activities included community events such as soccer tournaments or ambush theatre, smaller discussions and gatherings, such as digital story screenings, and individual interactions conducted through door to door outreach work. A table of intervention activities is included in the online Supplemental Digital Content (Table 4s, http://links.lww.com/QAI/A941) and more detail on the intervention is available elsewhere.[27,28] We did not include mass media campaigns or large rallies in the context of our study to avoid contamination between villages. Intervention targets were set per village; we aimed to reach 40% of the target age males with an OMC workshop in every village over a 2-year time frame. Community reach was monitored for fidelity and dosage (coverage).

Study Design

Communities were randomized using a balanced randomization approach.[29] After community randomization, the OMC intervention was carried out by local staff trained as community mobilizers for approximately 2 years. To measure changes in study outcomes over time, 2 cross-sectional, population-based surveys were conducted at baseline (March 2012–June 2012) and again in August 2014–November 2014. Surveys included a target of 1200 randomly sampled adults aged 18–35 years, with approximately 55 people in each community at both time points. The sampling frames for the baseline and endline surveys were the 2011 and the 2013 Agincourt HDSS annual census, respectively, limited to households with 18–35 years old residents and stratified by gender to create "male" and "female" sampling frames. Eligibility criteria for participation included residence in the home, being 18–35 years of age, and having lived in the study village for the majority of the past 12 months. The survey was interviewer-administered in the participant's home using Computer Assisted Personal-Interview. Written informed consent was obtained from all participants before the survey; both consent and the survey were offered in the local language, Shangaan, or English.

This study was approved by the Institutional Review Boards at the University of North Carolina-Chapel Hill and University of California-San Francisco, the Human Research Ethics Committee at the University of the Witwatersrand in South Africa, and the Mpumalanga Department of Health and Social Development Research Committee.

Measures

Uptake of HIV testing was defined as reported HIV testing in the previous year. We hypothesized that being in an intervention community could impact uptake of HIV testing either through direct contact with the program (direct exposure with activities and messages) or through a diffused mechanism, by which community norms and values around HIV change. As a result, we explored 2 exposure variables: community randomization assignment, which characterizes community exposure, and reported intervention exposure or dosage of intervention received by each individual, which characterizes individual exposure. Reported intervention exposure, or dosage, was measured by responses in the endline survey, including 19 items regarding participation in specific intervention activities (ie, spoke with an OMC community mobilizer; participated in an OMC soccer tournament). We coded self-reported participation with each possible OMC activity as binary (0,1), with the exception of the number of workshops attended, which had 4 categories. We fit a 1-parameter partial credit model to participants in intervention villages to assess item fit[30]; we then generated weighted maximum likelihood estimate scores for all participants (control and intervention) from this model.[31]

The mobilization measure (CMM), previously described and validated,[32] was used to quantify the 6 domains of mobilization and a combined or total CM score for every participant using standardized raw scores. Additionally, we aggregated individual responses on the survey into mean village mobilization scores for each community at baseline and endline. We hypothesized that community mobilization scores would impact HIV testing and would mediate the relationship between exposure and outcome.

Analyses

We examined differences in village and participants' characteristics between control and intervention samples at baseline and endline using comparison of means and proportions to examine any imbalance. We compared change in CMM scores and reported HIV testing over time using a t test to assess difference in means between control and intervention communities.

We used multilevel logistic regression to model individual reported HIV testing at endline as a function of intervention assignment, the village-level CM domain score, and their interaction. For significant interactions, simple slopes of CM within each level of intervention group assignment (control vs. intervention) were computed to produce marginal odds ratios. A random intercept term was used to account for dependence of individuals within the same villages.

Finally, to evaluate the entire pathway between intervention assignment and reported HIV testing uptake, we used structural equation modeling (SEM) with individual-level data. SEM allows us to jointly model the direct and indirect relationships between intervention assignment and the binary HIV testing variable through reported intervention exposure (dose) and individual community mobilization (both the overall score and the sub-scales) in a multilevel path analysis (Fig. 1). There was no evidence of effect modification by gender; as a result gender was included as a covariate. To account for the clustered data structure, village-level variance components were estimated for the endogenous variables dose/exposure, community mobilization, and HIV testing.

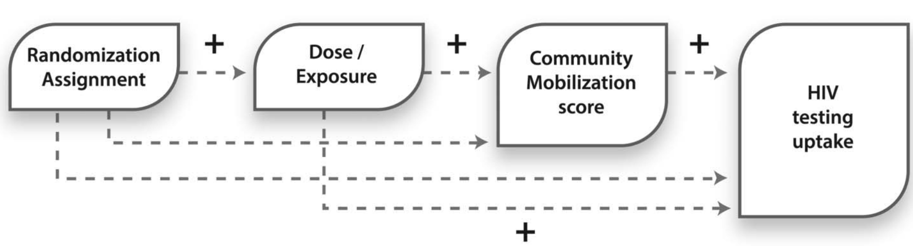

FIGURE 1. Conceptual path model: jointly modeling direct and indirect relationships between intervention assignment and reported HIV testing. Significant associations denoted by "+", controlling for gender.

Because HIV testing was a binary variable, the model was fitted using the M*plus* WLSMV weighted least squares probit estimator for binary and ordinal dependent variables (see Supplemental Digital Content for M*plus* code, http://links.lww.com/QAI/A941).[33] Global model fit of the SEM was assessed through the χ^2 test of exact model fit and the following approximate indices: the Comparative Fit Index (CFI),[34] the Root Mean Square Error of Approximation (RMSEA),[35] and the Weighted Root Mean Square Residual (WRMR).[36] A nonsignificant chi-square value, CFI $\geq$ 0.95, RMSEA $\leq$ 0.06, and WRMR $\leq$ 1.00 indicate excellent model fit.[37] For each effect we report the regression coefficient B, its 95% confidence interval, and the associated *P*-value.

All analyses are weighted to account for sampling design and clustering. Dosage (direct intervention exposure) scores were calculated in R 3.2 (R Foundation for Statistical Computing). Simple comparative *t*-tests were performed in Stata 14 (StataCorp, College Station, TX). Multilevel and SEM analyses were performed in M*plus* 7.4 (Muthen and Muthen).

RESULTS

A total of 1181 and 1174 people participated in the 2 cross-sectional surveys at baseline in 2012 and postintervention in 2014, respectively. In the baseline survey, a total of 2252 households were sampled. Contact was made with 1826 households (81%). Among the households contacted, 69% had an eligible resident (n = 1256); almost all ineligibility was due to nonresidence in the past 12 months. Among those eligible, 1181 people were enrolled into the study (94%), 66 (5%) refused to participate. Similar uptake was found in the endline survey. A total of 1928 households were sampled. Contact was made with 1816 households (94%). Among the households contacted, 65% had an eligible resident (n = 1183); again, most ineligibility was due to nonresidence. Among those eligible, 1174 people were enrolled into the study (99%), 9 (1%) refused to participate.

Village and Participant Demographics

Overall, villages were similar in compositional characteristics by design, although control villages had slightly smaller resident populations than intervention villages (Table 1; A). Participant demographics in control and intervention villages were also similar at both baseline and endline, showing nonsignificant differences (Table 1; B). A total of 54% of intervention residents (66% of men and 42% of women) reported engagement in OMC activities; 4%

TABLE 1. Demographic Characteristics of Intervention (n = 11) and Control Villages (n = 11) and Participants at Baseline (2012; n = 1181) and Endline (2014; n = 1175)

	Control Sample		Intervention Sample		
	Baseline	Endline	Baseline	Endline	
A. Village characteristics*	Unweighted % (SD)	Unweighted % (SD)	Unweighted % (SD)	Unweighted % (SD)	Baseline difference *P*†
Number of villages	11	11	11	11	
Total population (SD)	4279 (2376)	4535 (2580)	3673 (1950)	3929 (2022)	0.52
% Female headed household (SD)	0.41 (0.04)	0.42 (0.04)	0.42 (0.03)	0.43 (0.03)	0.60
Mean years education (SD)	6.14 (0.62)	6.46 (0.47)	6.02 (0.63)	6.39 (0.50)	0.66
% Migrant (SD)	0.18 (0.03)	0.28 (0.06)	0.17 (0.02)	0.27 (0.04)	0.37
% Employed (SD)	0.20 (0.01)	0.22 (0.01)	0.19 (0.02)	0.22 (0.02)	0.28
B. Participant characteristics‡	Weighted % (SD)	Weighted % (SD)	Weighted % (SD)	Weighted % (SD)	Baseline difference (*P*)†
Number of participants	592	585	589	590	
Mean age	23.8 (0.25)	25.0 (0.27)	24.1 (0.26)	24.7 (0.26)	0.46
Completed high school	0.30 (0.03)	0.35 (0.03)	0.38 (0.03)	0.38 (0.03)	0.22
Born outside South Africa	0.08 (0.02)	0.03 (0.01)	0.07 (0.01)	0.03 (0.01)	0.49
Received income in past 3 mo	0.33 (0.03)	0.32 (0.03)	0.38 (0.03)	0.30 (0.02)	0.17
Unmarried (vs. ever married)	0.75 (0.02)	0.78 (0.02)	0.75 (0.02)	0.77 (0.02)	0.96
HIV testing uptake in past 12 mo (N = 2349)	0.63 (0.03)	0.69 (0.03)	0.60 (0.03)	0.67 (0.03)	0.56
C. Community mobilization‡	Weighted means (SD)	Weighted means (SD)	Weighted means (SD)	Weighted means (SD)	Mean difference *P*§
Mean total CMM score (SD)	0.07 (0.19)	−0.06 (0.16)	0.05 (0.18)	−0.05 (0.14)	0.40
Social cohesion	−0.02 (0.20)	0.11 (0.17)	−0.16 (0.21)	0.04 (0.28)	0.38
Critical consciousness	0.02 (0.26)	0.01 (0.33)	−0.05 (0.24)	0.02 (0.23)	0.41
Shared concerns	−0.06 (0.14)	0.04 (0.18)	−0.04 (0.14)	0.03 (0.23)	0.67
Leadership	−0.05 (0.27)	0.01 (0.31)	−0.06 (0.22)	0.09 (0.24)	0.19
Organizations/Networks	0.09 (0.27)	−0.04 (0.21)	0.04 (0.25)	−0.09 (0.24)	0.96
Collective action	0.34 (0.31)	−0.34 (0.19)	0.24 (0.25)	−0.21 (0.21)	0.02

*From Census Data.
†F statistic for the difference in baseline proportions; mean age is a weighted regression.
‡From Survey Data; all survey data is weighted to account for sampling probabilities.
§*t* Test examining difference in means over time (n = 22 villages for section C).

of control residents (6% of men and 2% of women) reported any OMC engagement in the final survey (data not shown).

Village Level Analysis

Mean village mobilization domain scores went up in intervention communities in 4 domains, but dropped in 2 others (Organizations and Networks and Collective Action). Total CM scores dropped in both control and intervention villages, and while they decreased less in the intervention communities as compared with control villages from baseline to follow-up, these differences were not statistically significant (Table 1; C). The only exception was the "collective action" domain, which dropped significantly more in control villages.

The primary community-level analysis yielded null results. Reported testing increased significantly in both control and intervention sites and differences between baseline and endline were not significant ($P = 0.88$). Interestingly, although testing and CM increases did not differ significantly by arm, the relationship between CM and HIV testing did. Village-level CM was associated with higher reported HIV testing in the endline survey in intervention communities only. The overall CM score and 2 of 6 CM domains, including critical consciousness and shared concerns, were significantly associated with reported HIV testing after the intervention and interacted with intervention assignment (Table 2). For example, for every standard deviation (SD) increase in critical consciousness, the odds of reporting HIV testing increased for intervention village participants (odds ratio (OR):1.44, $P = <0.01$) but not for control village participants. Social cohesion, leadership, presence of organizations, and collective action were not significantly associated with reported HIV testing in intervention communities vs. control communities. For the combined mobilization score, every standard deviation increase in CM score was associated with increased odds of reported HIV testing in intervention village participants (OR: 2.62, $P = <0.001$) but not for control village participants (OR: 1.18, $P = 0.53$; Fig. 2).

TABLE 2. HIV Testing Uptake as a Function of Village Mean Community Mobilization Score, Intervention Group Effects, and Their Interaction, Using Multilevel Logistic Regression at Endline

CM Variable	Interaction *P*	Control OR (95% CI)	Intervention OR (95% CI)
Cohesion	0.26	0.95 (0.66 to 1.24)	1.17 (0.95 to 1.38)
Consciousness	**0.04**	1.02 (0.81 to 1.22)	**1.44 (1.05 to 1.82)**
Concerns	**0.01**	1.17 (0.94 to 1.40)	**1.78 (1.39 to 2.16)**
Leadership	0.93	1.12 (0.82 to 1.42)	1.10 (0.79 to 1.41)
Organizations & networks	0.75	1.43 (0.96 to 1.91)	1.31 (0.72 to 1.90)
Collective action*	0.28	1.13 (0.75 to 1.52)	1.44 (1.05 to 1.82)
CM total	**0.02**	1.18 (0.57 to 1.78)	**2.62 (1.62 to 3.61)**

Boldface type: Significant interaction effect (at *P*-value < 0.1) and significant intervention group slope (at *P*-value < 0.05).

Analysis *N*s ranged from 1166 to 1174 due to small amounts of missing data.

*Simple effects after nonsignificant interaction terms should not be interpreted.

Individual Level Analysis

SEM results appear in Table 3. The overall fit of the model to the data was excellent: χ^2 (DF = 3) = 2.42, $P = 0.49$; CFI = 1.00; RMSEA = 0; WRMR = 0.35. Significant positive direct effects of intervention assignment on reported intervention exposure (dose), intervention exposure on CM, and CM on reported HIV testing were observed (Fig. 1). In addition, reported individual exposure was independently associated with reported HIV testing. Female gender was associated with lower intervention exposure, which is expected given the interventions' focus on men, and a higher proportion of reported HIV testing, which is consistent with national trends.[4] The indirect effect of intervention assignment on reported HIV testing through dose exposure and community mobilization was also positive and statistically significant (B = 0.027; $P = 0.03$), indicating that randomization assignment affected HIV testing through intervention exposure and community mobilization. However, there was no evidence of a direct effect of community intervention assignment on reported HIV testing—consistent with the primary village-level analysis. Taken together, these findings suggest that the association of village randomization assignment with reported HIV testing is fully mediated by individual exposure (dose of intervention) and community mobilization. Examination of the CM subscales in separate subscale-specific SEMs revealed substantively similar results for the collective action (B = 0.017; $P = 0.003$), shared concerns (B = 0.015; $P = 0.01$), critical consciousness (B = 0.007; $P = 0.02$) and organizations and networks (B = 0.022; $P = 0.001$) subscales. In contrast, cohesion and leadership subscales did not mediate the association between intervention exposure and reported HIV testing, though dose was significantly associated with social cohesion scores.

DISCUSSION

We found that overall reported HIV testing increased in the study area, but no more so in communities that received the intervention compared with those that did not. However, we also found evidence that in the intervention communities, mean village CMM scores were predictive of testing uptake and that individual intervention exposure was associated with higher levels of reported mobilization and, in turn, a higher probability of reported HIV testing. Our findings indicate that the OMC community mobilization program did have a positive impact on reported HIV testing; however, this impact seems to function largely through direct intervention exposure of highly dosed individuals and less so through diffusion of ideas and norms to other community members. In other words, there is strong evidence that for those who experienced a greater amount of intervention activities, the perception of their community changed, and that this perception was associated with higher reported HIV testing.

The apparent lack of diffusion of ideas and norms impacting HIV testing uptake may have occurred for a number of reasons. First, HIV testing was a secondary intervention focus; it is possible that with a more intensive focus on testing, a community effect might have occurred. We did find a community effect of CM on the primary intervention focus,

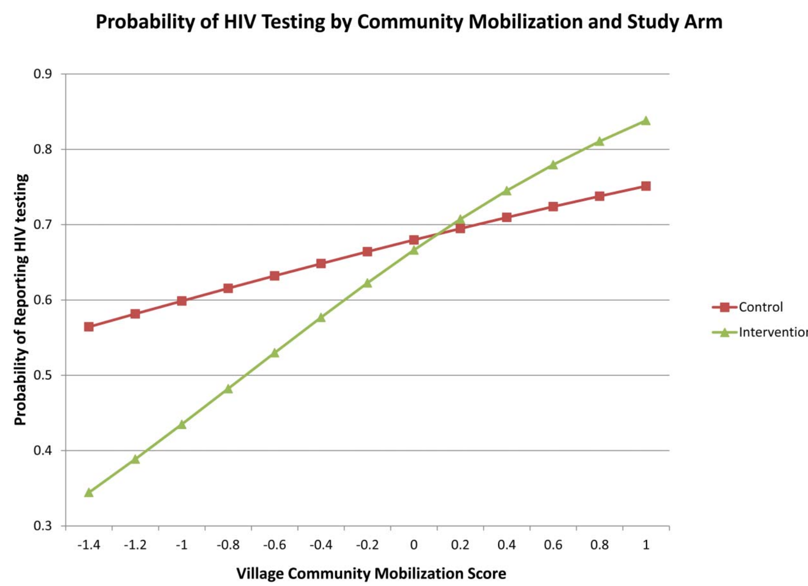

FIGURE 2. Probability of reported HIV testing by village community mobilization measure (CMM) scores at endline.

changing gender norms (manuscript under review). Second, the time needed for norms around HIV testing and care to change and be internalized by the highly exposed participants and then shared with and diffused to family and friends may be longer than the 2 years allotted to this intervention, particularly as HIV, and thus clinic attendance for testing, is highly stigmatized in this context.[38] A small number of community-level mobilizing interventions have demonstrated community effects on HIV-testing, however, these were lengthier (3 to 4 years), and one included facilitated access to community-based testing.[12,21] Finally, the potential for the intervention to diffuse might have been weakened by the extent of migration in the area. A large proportion of the population is involved in temporary or circular migration for work, particularly the population targeted by this intervention (men ages 18–35 years).[39] This migration would render diffusion of ideas more difficult, as participants who engaged in the intervention may leave.

Although we did not see evidence of diffusion to the greater community, we did see a strong relationship between experiencing the intervention and both CMM scores and HIV testing. At the village level, mean community mobilization scores were associated with increased HIV testing uptake, with overall CM as well as shared community concerns around HIV and critical consciousness being associated with testing uptake in the intervention villages. Further, in individual analysis using SEM, there was strong evidence that indirect effects fully mediated the association of randomization assignment on reported HIV testing. The pathway occurs through personal intervention exposure (dose) and dose plus overall mobilization score (as well as shared concerns, critical consciousness, organizations and networks, and collective action each independently). The implication is that being involved in the OMC activities impacted an intervention resident's likelihood of reported HIV testing both through being exposed to the intervention and through the CM mechanism. Those who engaged in more activities were also more likely to perceive their community as more critically conscious, more collectively concerned with HIV

TABLE 3. Structural Equation Model Direct Effects: Estimates and 95% Confidence Intervals (N = 1175)

Outcome Variable	Explanatory Variable	B	95% CI	*P*
Dose (reported exposure)				
	Intervention assignment	2.89	2.15 to 3.64	<0.001
	Female gender	−0.69	−0.94 to −0.44	<0.001
Community mobilization				
	Dose (reported exposure)	0.02	0.01 to 0.02	<0.001
	Intervention assignment	−0.04	−0.13 to 0.06	0.46
	Female gender	−0.003	−0.03 to 0.03	0.86
HIV testing				
	Community mobilization	0.54	0.42 to 0.65	<0.001
	Dose (reported exposure)	0.04	0.01 to 0.07	0.01
	Intervention assignment	−0.11	−0.33 to 0.12	0.34
	Female gender	0.78	0.64 to 0.91	<0.001

B is the unstandardized regression coefficient; 95% CI is the 95% confidence interval of B.

prevention, and more active in working together. Together, the intervention exposure and perceptions of CM both encouraged uptake of HIV testing.

The largely untapped potential of CM could be considerably improved if we understood more about the mechanisms taking place as communities engage in CM strategies and improve health outcomes. Despite the common use of CM strategies in HIV prevention efforts now, little is known about if, why and how these approaches work.[11] This gap is partially due to poor attention to theoretical conceptualization and is also the result of a lack of validated measures of CM processes.[40] Using our validated CM measure[32] we were able to empirically test changes in reported community mobilization. Mean mobilization measures did not go up significantly over time in the intervention villages as was expected; this could represent a secular trend towards more disenfranchisement and growing disillusionment in the area (note that scores often dropped more excessively in the control than in the intervention villages), or simply a lack of power to detect effects with an n = 22. However, we also found empirical evidence that more engagement in the intervention resulted in higher CM scores and that a number of CM domains were associated with reported HIV testing uptake in intervention communities, namely critical consciousness and shared concerns. Although the other domains, such as leadership, were not associated with HIV testing in this short intervention, this was also more difficult to cultivate in a short time frame.[10,32]

There were some limitations of this research. We were able to randomize only 22 villages, resulting in limited power to detect differences in community effects. The outcome, HIV testing, was self-reported; it is possible that those who were more engaged with the intervention may have felt disproportionate pressure to report getting HIV tested. Additionally, there remains the possibility of contamination or control village residents being exposed to intervention activities underway in neighboring villages. Approximately, 4% of control residents reported engaging in some OMC activities (as compared with 54% of intervention village residents). Also notable is that this intervention model excluded mass media campaigns to minimize contamination in the context of an RCT. This omission likely detracted from the reach and impact of the intervention, as mass media campaigns have successfully promoted dialogue around HIV testing and resulted in greater uptake.[41] As noted above, there is also a strong likelihood that mobility of the population undermined intervention effects and the exclusion of nonresidents in the survey would limit generalizability of the findings to only nonmigrant men and women.

Secular trends in HIV testing in South Africa also likely impacted the findings. There were National HCT campaigns running both before and simultaneous to the intervention. Nationally, the number of people reporting recent testing significantly increased between 2008 and 2012 ($P < 0.001$).[4] Further, reported HIV testing in the study area was significantly higher at baseline (approximately 60%) than that reported nationally (approximately 40%), which is likely due to the area being a health surveillance site with ongoing research that included HIV-related messaging since 2010. Both national campaigns and local initiatives could well have coaxed more predisposed residents to accept an HIV test, leaving those more resistant to HIV testing as the target group, who would require more extensive intervention exposure to uptake testing. This pattern would weaken the potential to observe village effects through diffusion, but is consistent with the individual level findings that heavy exposure to programming is associated with reported HIV testing.

CONCLUSIONS

This theory-based CMA did have a positive impact on perceived mobilization and reported HIV testing uptake among those exposed to it; we did not find evidence of intervention impact through diffusion of ideas and norms to other community members. The ultimate benefit of CMAs lies in the ability to diffuse beyond the immediate participants to effect the greatest change possible. As a result, further work is needed to understand the amount, nature, and duration of intervention required to observe broader impacts in the community as a whole. We also found evidence that for those exposed, their perception of their community changed, and that this perception was associated with improvement in reported HIV testing uptake, consistent with our conceptual model. There was less evidence that some aspects of the mobilization model (ie, leadership) were associated with improved outcomes for intervention villages. Future research should shed light on whether all domains are primary to the conceptual model or whether some domains simply require a different approach to achieve change (ie, how to foment more effective leadership around HIV and health promotion). Additionally, future research should assess the cost-effectiveness of CMAs in improving testing uptake as compared with other intervention approaches.

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