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Provider-Initiated HIV Testing and Counseling in Low- and Middle-Income Countries: A Systematic Review

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Abstract

Provider-initiated HIV testing and counseling (PITC) has expanded since 2007 WHO guidelines were established. We conducted a systematic review of PITC in low- and middle-income countries. Peer-reviewed studies were included if they measured pre-post or multi-arm outcomes. Two coders abstracted data using standardized forms. Nineteen studies were included, all from sub-Saharan Africa (N=15) or Asia (N=4). Studies were conducted in clinics for antenatal/family planning/child health (N=12), tuberculosis (N=4), outpatient (N=1), sexually transmitted diseases (N=1), and methadone maintenance (N=1). HIV testing uptake increased after PITC. Condom use also increased following PITC in most studies; nevirapine uptake and other outcomes were mixed. Few negative outcomes were identified. Findings support PITC as an important intervention to increase HIV testing. PITC's impact on other outcomes is mixed, but does not appear to be worse than voluntary counseling and testing. PITC should continue to be expanded and rigorously evaluated across settings and outcomes.

Keywords

provider-initiated testing and counseling; HIV testing; systematic review

INTRODUCTION

Provider-initiated HIV testing and counseling (PITC) refers to HIV testing and counseling which is routinely recommended by health care providers to persons attending health care facilities as a standard component of medical care (1). With this approach, an HIV test is recommended for all patients whose clinical presentation might result from underlying HIV infection, irrespective of epidemic setting, or as a standard part of medical care for all patients attending health facilities in generalized HIV epidemics. PITC is distinguished from client-initiated HIV testing and counseling (CITC) model, often referred to as voluntary counseling and testing (VCT), in which individuals seek HIV testing and counseling services on their own initiative. PITC may include both opt-in and opt-out approaches, although an opt-out approach, where individuals who do not wish to be tested must specifically decline the HIV test after receiving pretest information, is more common.

In 2007, the World Health Organization (WHO) issued guidelines recommending that countries and organizations adopt PITC to increase HIV testing rates (1). These guidelines were developed because HIV testing rates globally remained low, despite increased access

to HIV treatment, care, support and prevention services, and few people living with HIV were aware of their status. Although WHO recommended increased scale-up of CITC as well, PITC was recommended because of “the need for additional, innovative and varied approaches” to HIV testing (1). The guidelines recognize that health care facilities present opportunities for contact with individuals who could benefit from HIV testing and counseling and facilitated access to HIV-related services. However, concerns were raised about the potential for coercion of patients and adverse outcomes of disclosure when clients did not themselves initiate the decision to test for HIV (2).

Previous research on VCT has suggested that VCT not only allows individuals to learn their HIV status and access appropriate services, but that it may also affect HIV-related risk behavior. For example, a systematic review of VCT in developing countries, conducted prior to the WHO distinction between PITC and CITC, suggested a moderate protective effect of VCT (3). In meta-analysis, VCT recipients were significantly less likely to engage in unprotected sex when compared to their behaviors before receiving VCT, or when compared to participants who had not received VCT (OR 1.69; 95%CI 1.25–2.31), but there was no significant difference in the reported number of sex partners (OR 1.22; 95%CI 0.89–1.67). (3)

A recent review found that prior to PITC introduction, HIV testing uptake among women in antenatal care (ANC) settings ranged from 5.5%–78.7%, while after PITC introduction, uptake among this population increased by 9.9%–65.6% across studies (4). However, the review only included ANC settings, and it only included studies that measured HIV testing uptake. Although ANC is clearly a key location for PITC, the intervention has expanded greatly in recent years in other clinical settings, including general medicine wards and tuberculosis clinics. Further, the effect of PITC on behavioral outcomes is critical for assessing the overall impact of PITC. The risk reduction effects of PITC may be less than for standard VCT given the reduced emphasis on counseling. Another concern is that women who receive PITC during ANC may be less prepared to know their HIV serostatus and therefore less likely to accept or adhere to prevention of mother to child transmission (PMTCT) interventions, or less likely to return for medical care in general, than women who receive VCT.

To date, the evidence to answer these questions has not been assessed in a systematic manner. We conducted a systematic review of the literature on the effect of PITC on behavioral, psychological, social, care or biological outcomes in low- and middle-income countries.

METHODS

This review is part of the Evidence Project: a series of systematic reviews of HIV behavioral interventions in low- and middle-income countries conducted jointly by the Medical University of South Carolina, the World Health Organization, and the Johns Hopkins Bloomberg School of Public Health. Other interventions that have been systematically reviewed through the Evidence Project include VCT (3), mass media (5), psychosocial support (6), treatment as prevention (7), peer education (8), and positive prevention (9), and condom social marketing (10). We follow standardized methods for reporting across all reviews consistent with established guidelines (11).

Definition of PITC

Our definition of PITC aligned with the 2007 WHO guidelines described above (1). Specifically, individuals, couples, or groups had to receive pre- and post-test counseling about HIV and an HIV test. However, pre-test counseling could be minimal, particularly in

opt-out settings. These individuals, couples, or groups then had to learn, or have the opportunity to learn, their HIV infection status. HIV testing had to be initiated by a provider using either an opt-in or opt-out approach. Further, HIV testing had to be conducted in a health care setting where individuals were seeking health care services other than HIV testing.

While we followed the WHO PITC definition created in 2007, we did not limit our review to studies conducted after this time or to studies that explicitly said they had provided PITC. Instead, we included all studies evaluating interventions that met the definition above to broadly consider all evidence on this approach to HIV testing, regardless of the terminology used to describe it.

Inclusion criteria

To be included in the review, an article had to meet the following criteria:

1. Published in a peer-reviewed journal.
2. Evaluate a PITC intervention as described above.
3. Use a pre/post or multi-arm design comparing individuals who received PITC to those who did not to assess post-intervention outcomes of interest.
4. Measure a behavioral, psychological, social, care or biological outcome other than uptake of HIV testing. Studies measuring HIV testing uptake as the only outcome were not included. However, if studies measured HIV testing uptake in addition to other behavioral, psychological, social, or biological outcomes, HIV testing uptake was recorded.
5. Conducted in a low, lower-middle, or upper-middle income country, according to the World Bank country classification scheme (12).

No restrictions were placed based on intervention setting (ANC clinics, TB clinics, etc.). No language restrictions were used. Articles not meeting these inclusion criteria but otherwise relevant to the review, such as reviews of similar topics, qualitative research, and cost-effectiveness analyses, were included as background studies.

Study designs

Any intervention study involving a pre-post or multi-arm comparison of individuals or groups who received PITC versus those who did not was considered eligible for inclusion. This could include either participants who received PITC versus a control or comparison group, or participants before and after receiving PITC. Studies could have either a control group that did not receive any type of intervention, a comparison group that received another form of HIV testing (such as VCT), or a separate intervention on a different topic.

Search strategy

The following electronic databases were searched using the date ranges January 1, 1990 to July 16, 2010: PubMed, PsycINFO, Sociological Abstracts, CINAHL, and EMBASE. In addition, the table of contents of four journals were reviewed: *AIDS*, *AIDS and Behavior*, *AIDS Education and Prevention*, and *AIDS Care*. Secondary reference searching was conducted on all included studies. Finally, selected experts in the field were contacted to identify any additional articles.

Search terms

The following terms were entered into all computer databases: [(“provider-initiated” OR PITC OR PICT OR “routine testing” OR “opt-out”) AND (HIV OR AIDS)] OR [(“health care facility” OR “health care setting” OR “antenatal” OR hospital OR clinic) AND (“HIV testing” OR “HIV counseling and testing” OR “HIV counselling and testing” OR HTC OR HCT OR “HIV test” OR “tested for HIV”)]

Screening abstracts

Titles, abstracts, citation information, and descriptor terms of citations identified through the search strategy were screened in a two-step process. First, study staff screened records individually to remove all clearly non-relevant records. Second, two study team members double-screened the remaining records and compared results. Full text articles were obtained for all selected records and two independent reviewers again assessed all full-text articles for eligibility. Differences at each stage were resolved through consensus.

Data extraction and management

Data were extracted independently by two trained reviewers using standardized data extraction forms. Differences in data extraction were resolved through consensus and referral to a senior study team member when necessary.

The following information was gathered from each included study: location, setting & target group; years (period of study); description of the intervention; study design; sample size; age range, gender; random or non-random allocation of participants; length of follow-up; outcome measures; comparison groups; effect sizes; confidence intervals; significance levels; and limitations identified by authors and reviewers. Study quality (rigor) was assessed using an 8-item assessment tool developed for other HIV behavioral intervention systematic reviews by The Evidence Project (3, 7–9). Background studies were assessed using a greatly simplified data extraction form.

Data Analysis

Data were analyzed according to coding categories and outcomes. Meta-analysis was not conducted due to the heterogeneity of intervention modalities and measured outcomes.

RESULTS

Our initial database search yielded 11,965 records; 68 additional records were identified through other means, such as searching reference lists of relevant articles (Figure 1). Once all duplicates were removed, 8,393 records were screened by a single study team member and 8,173 were excluded for being unrelated. The remaining 220 records were screened in duplicate by two study staff, and 133 were excluded at this level. The full text of 87 articles was retrieved for additional review. Of these, 6 were excluded because the interventions took place in developed countries, 5 did not meet the study design criteria, 5 did not include PITC, 2 could not be located, and 50 were coded as background (including 3 that provided duplicate results as an included article). The remaining 19 studies were deemed eligible for inclusion in our review (13–31). One of these articles was originally in French (17); it was translated into English for inclusion. All remaining included articles were in English.

Table 1 describes the included studies. The vast majority of included studies (N=15) were conducted in sub-Saharan Africa, including Rwanda (N=3) (13–15), Côte d’Ivoire (N=3) (17, 20, 30), Kenya (N=2) (22, 29), Zambia (N=2) (21, 27), Botswana (N=1) (19), Democratic Republic of Congo (N=1) (28), Malawi (N=1) (25), Uganda (N=1) (24), and Zimbabwe (N=1) (18). The remaining 4 studies were conducted in China (N=2) (23, 26),

India (N=1) (16), and Thailand (N=1) (31). The majority of the studies were conducted prior to the 2007 publication of WHO guidelines on PITC. Most of the older studies used enzyme linked immunosorbent assay (ELISA), with positive results confirmed by Western Blot or indirect immunofluorescence, with results returned between 1 week and several weeks after the initial test, while more recent studies used same-day rapid test.

An assessment of rigor across studies showed some weaknesses (Table 2). There was one group randomized trial (23), while most other studies were pre/post or serial cross-sectional designs. Ten studies followed the same individuals over time, usually before and after HIV testing (13–17, 20, 23, 24, 27, 31). Seven studies included a control or comparison group (15, 18, 20, 23, 27, 28, 30).

The included studies were conducted in a variety of health care settings. Most (N=12) were conducted in ANC, family planning, or postpartum/child health care settings (13–15, 17–20, 23, 25, 27, 29, 31), while 4 were conducted in tuberculosis (TB) clinics (21, 22, 28, 30), 1 in an outpatient department (24), 1 in a sexually transmitted diseases (STD) clinic (16), and 1 in methadone maintenance clinics (26). Each of these settings comprises a different patient population and presents unique implementation challenges, so we present results separated by setting below.

ANC clinics, FP clinics, and postpartum/child health clinics

The majority of PITC studies (N=12) were conducted in ANC, family planning, or postpartum/child health care settings (13–15, 17–20, 23, 25, 27, 29, 31).

Serial cross-sectional comparing opt-in versus opt-out testing—Of the twelve studies, four compared opt-in versus opt-out HIV testing in ANC using serial cross-sectional designs. These studies compared women who tested during opt-in periods to different women who tested in opt-out periods. Opt-in testing was usually described as routine HIV testing incorporated into the battery of ANC tests with right of refusal. Pre-test counseling was generally conducted in group settings, while post-test counseling was conducted individually when mentioned.

In Zimbabwe, after adopting an opt-out approach, significantly more pregnant women were tested for HIV (65.1% to 99.9%, $p<0.001$) and received post-test counseling and collected their results (96.9% to 99.8%, $p<0.001$) than during the opt-in approach; there was no significant difference in partners receiving HIV testing or post-test counseling (18). Among women who tested HIV-positive, more women in the opt-out period received post-test counseling and collected their results (95% to 98%, $p<0.001$). While a greater absolute number of women were known to have delivered in antenatal clinics, there was a statistically significant reduction in the proportion of women who were known to have delivered in antenatal clinics after opt-out testing was enacted (38.1% to 27.6%, $p<0.001$). There were no significant differences in the number of women given single dose nevirapine to take home (76.3% to 71.6%) or the number of infants receiving single dose nevirapine (36% to 28%), although in both cases, rates were lower during the opt-out period.

In Botswana, opt-out testing led to significant increases in HIV testing [both clinic-recorded (76% to 95%, $p<0.001$) and self-reported (69.4% to 92.3%, $p<0.001$); PMTCT knowledge scores (mean correct answers 7.4 to 8.2, $p<0.001$); proportion of clients who receive their HIV test results (72% to 82%, $p<0.001$); and proportion of HIV-positive clients who report disclosure of their status to their family (34.2% to 62.5%, $p=0.04$) (19). The raw number of new ANC clients per month reportedly increased, but statistical significance was not reported. However, there were no statistically significant changes in proportion of clients who reported the following outcomes: think all pregnant women should test for HIV, know

how to receive ART, aware of local HIV-positive support organizations, returned to clinic for ANC after testing, began AZT after testing HIV-positive, and interested in a support group. The proportion of women who disclosed to partners actually fell, but this change was also not statistically significant. The study did not find a statistically significant reduction in the percentage of clients reporting domestic violence after HIV-positive serostatus disclosure, but this dropped from 6.1% during opt-in testing to 0% during opt-out testing.

In Malawi, HIV testing uptake rose after the introduction of opt-out testing, from 45% to 73% to over 99% ($p<0.001$) (25). HIV testing uptake among infants born to HIV-positive women also increased after adoption of the opt-out approach, from 19.4% to 34.5% ($p<0.001$), and the percentage of pregnant women delivering in facilities increased from 23.5% to 54.6% ($p<0.001$).

In Kenya, after opt-out testing was instituted, a significantly greater proportion of women were pretest counseled (77% to 92%, $p<0.001$) and accepted HIV testing (80% to 83%, $p<0.001$) (29). Overall, the percentage of women attending their first ANC visit who learned their HIV test results increased (55% to 68%, $p<0.001$) and nevirapine uptake increased (57% to 70%, $p<0.001$). There was no statistically significant change in the proportion of women who were post-test counseled.

Cohort, before/after, or time series—Six studies examined the impact of PITC on individual women using cohort, before/after, or time series designs. These studies compared the same women before and after HIV testing.

Two of these studies came from the same research group in Côte d'Ivoire (17, 20). Eighteen months after antenatal HIV testing and counseling, both HIV-positive and HIV-negative women reported increased rates of ever using condoms (HIV-positive: 23.2% to 48.8%, $p<0.01$; HIV-negative: 36.4% to 58.7%, $p<0.01$) and increased discussions with their regular partners about STIs (HIV-positive: 28.4% to 65%, $p<0.01$; HIV-negative 65.1% to 96.6%, $p<0.01$); women who refused HIV testing did not show any change in these outcomes (20). No significant difference was found between women who accepted and refused HIV testing in disclosure to their regular partner of their HIV test result (for women who tested) or disclosure to their regular partner of being offered an HIV test (for women who did not test). There was also no significant difference in suggesting that their partner undertake HIV testing or use condoms in case of extra conjugal relationships. After family planning counseling was provided along with HIV testing, contraceptive use rates were slightly higher at most post-pregnancy time periods compared with reported use anytime in the 2 years prior to pregnancy among both HIV-positive and HIV-negative women (17).

Three older studies published in 1992–1993 came from the same research team in Rwanda (13–15). Recruiting childbearing women into a time series study and offering HIV testing and counseling in an antenatal setting, these articles found that after HIV testing and counseling, HIV seroconversion rates declined significantly from 4.1 to 3.0 per 100 person years; this decline was greater among women whose partners were also tested (4.1 to 1.8 per 100 person years) compared to women whose partners did not test (4.1 to 3.4 per 100 person years) (13). Among HIV-positive women, gonorrhea incidence declined significantly after HIV testing (13% to 6%, $p<0.05$) (13). Among HIV serodiscordant couples, reported condom use increased from 4% at baseline to 57% at one year follow-up (15). When family planning counseling was provided to women in addition to HIV testing, rates of hormonal contraceptive use increased from 17% to 18% among HIV-negative women but decreased from 23% to 16% among HIV-positive women; statistical significance of these results was not provided (14).

The final study enrolled women from family planning clinics and a postpartum ward in a hospital in Thailand (31). This study found statistically significant increases in communication about condom use (89% vs. 19%, $p<0.05$), communication about HIV test for husband (94% vs. 35%, $p<0.05$), and communication about HIV risk from husband (94% vs. 66%, $p<0.05$) at 6 month follow-up compared to baseline. There were slight declines in these outcomes at 12 month follow-up, but these were not statistically significant except for communication about condom use (78% vs. 89%, $p<0.05$). With respect to reported condom use behavior, participants reported more consistent condom use at 6 and 12 month follow-ups (5% and 5% vs. 2% at baseline, $p<0.05$); condom use “most times” did not change; and sometime condom use showed a statistically significant improvement from baseline to 6 month follow-up, followed by a statistically significant decline at 12 month follow-up (6% to 41% to 21%, both $p<0.05$).

Group randomized or non-randomized trials—The remaining two studies assigned participants as groups to intervention and control groups either randomly or non-randomly. In China, a group randomized trial compared individual versus couples PITC for pregnant women and their male partners (23). Following PITC, pregnant women in both groups showed significant improvements in HIV-related knowledge and in willingness to be tested for HIV. In Zambia, a non-randomized group trial in two antenatal settings compared universal nevirapine therapy (provision of nevirapine without HIV testing) to targeted nevirapine therapy (provision of nevirapine to HIV-positive patients identified through HIV testing) (27). Adherence to nevirapine was higher in the targeted versus universal approach (non-adherence rates: 26% vs. 39%, $p=0.044$) although the number without nevirapine detected in the cord blood was not significantly different (31% vs. 23%, $p=0.23$). Nevirapine uptake was significantly higher in the universal strategy (AOR 1.5; 95% CI 1.1–2.1).

TB clinics

Four studies were conducted in TB clinics (21, 22, 28, 30). In Zambia, staff training and implementation of HIV screening within TB departments were associated with a 38% increase in the proportion of antiretroviral treatment (ART) department patients who were co-infected with TB (suggesting successful case identification) in a serial cross-sectional design comparing 3 months before the program to 3 months afterwards (21). In Kenya, after TB clinics initiated HIV testing and associated care services, the proportion of HIV/TB co-infected patients receiving ART or TB treatment increased, the success rate of the TB program increased, the death rate decreased, and the rate of transfers out of the TB program decreased; there was no statistically significant change in the TB program failure rate, default (drop out) rate, or proportion of TB smear-negative patients (22). In the Democratic Republic of Congo, a non-randomized, multi-arm trial compared three models of PITC for TB patients (28). The three study arms corresponded to three levels of referral: off-site referral to a free-standing VCT center, on-site referral within the same primary health care center, and routine PITC in the TB clinic. HIV testing uptake was high (95–98%) when performed at the TB clinic or primary health care center, but significantly lower (68.5%) for the off-site referral arm. However, more patients received post-test counseling with VCT or on-site referral compared to routine PITC (100% vs. 97.3% vs. 95%, $p=0.002$). There was no difference across study arms in the proportion of HIV-positive individuals who started cotrimoxazole treatment. Finally, in Côte d'Ivoire, a study conducted at two outpatient TB clinics found higher rates of HIV knowledge 4 months after PITC (27.9% to 60.2%, $p<0.01$) and among individuals who accepted HIV testing compared to those who refused (64.2% vs. 52.6%, $p=0.04$), but an increase in consistent condom use from baseline to follow-up among men (9.9% to 23.6%, $p=0.001$) but not women, and no difference in consistent condom use at follow-up between those who accepted testing and those who refused (30).

Outpatient clinics

In Uganda, a before/after study at a rural public hospital outpatient clinic followed 245 individuals who received PITC to assess changes in sexual behavior, partner HIV testing, disclosure, and HIV care seeking behavior (24). This study was one of the few to explicitly frame the research in the context of PITC. Comparing behavior in the 3 months preceding PITC to behavior in the 3 months after PITC, the percentage of participants who reported engaging in risky sex decreased and knowing their partner's status increased for both HIV-positive and HIV-negative participants.

STD clinics

One study was conducted in STD clinics in Pune, India (16). After receiving HIV testing and counseling, participants were followed over 24 months in a time series design. There was a reduction in the proportion of men reporting visiting commercial sex workers after PITC, from 65% at baseline to 16% at 6 months and 23% at 24 months of follow-up. There was also an increase in reported consistent condom use with sex workers after PITC, from 10% at baseline to 36% at 6 months and 41% at 24 months of follow-up.

Methadone maintenance clinics

One study was conducted in eight methadone maintenance clinics across China (26). Using a serial cross-sectional design with non-randomly selected clients, assessments were conducted at baseline (N=585), 4 months (N=609), and 12 months (N=468). There was a statistically significant reduction in injection drug use and drug-related criminal activities over time, and a statistically significant improvement in employment and harmonious family relationships. However, because participants received both PITC and methadone maintenance, it was not possible to separate the effect of PITC alone on these outcomes.

DISCUSSION

We identified 19 studies that examined the effect of provider-initiated HIV testing and counseling on HIV-related outcomes in developing countries. While the majority of these studies were conducted in antenatal care settings in Africa, there was some diversity in both geographical location and health care setting. Four studies were conducted in China, India, and Thailand, while no studies were identified elsewhere. This likely reflects the global burden of HIV and associated research and interventions. We also identified studies from TB, outpatient, STI, and methadone maintenance clinics, highlighting the diversity of settings where PITC is being offered and where it should be evaluated. The majority of studies were conducted before WHO PITC guidelines were developed, indicating that provider-initiated testing was occurring in many locations prior to global guidance.

Although assessing uptake of PITC was not the main research question, all studies included in this review that reported rates of HIV testing uptake showed increases associated with a PITC approach. This finding is similar to results of another systematic review of PITC that included both developed and developing countries (4). Collectively, the available evidence clearly indicates that PITC increases HIV testing rates, often by quite large amounts. As HIV testing is a gateway to care and treatment and uptake of PMTCT interventions for those who test positive, and is important in decision-making about HIV prevention and uptake of some prevention interventions, this is a very encouraging finding.

However, the effect of HIV testing on other outcomes showed mixed results. After receiving PITC, rates of reported condom use appeared to increase in most, but not all, studies. Four studies compared women in ANC who received opt-in versus opt-out testing; of the three that measured nevirapine uptake, two showed no difference and one showed an increase in

nevirapine uptake. The two studies that measured outcomes related to partners – HIV testing uptake among partners and disclosure to partners – both showed no significant differences between opt-in and opt-out testing. It is difficult to attribute these differential effects to any particular cause, as there was significant study heterogeneity across countries, programs, and target populations.

While there were several non-significant findings, there were very few negative effects. However, one study comparing opt-in versus opt-out testing during ANC in Zimbabwe found that while a greater absolute number of women were known to have delivered in antenatal clinics, there was a statistically significant reduction in the proportion of women who were known to have delivered in antenatal clinics with opt-out testing (18). The authors did not discuss this particular finding so it is difficult to contextualize, and outside factors including economic instability and related service delivery challenges may be unique to Zimbabwe. However, this finding does raise concerns that women tested in ANC under opt-out guidelines might not always be fully ready to adopt preventive health behaviors. The only other negative effect was from an early study showing decreased rates of hormonal contraceptive use from 23% to 16% among HIV-positive women following testing; the authors attributed this decline to a lack of ready access to hormonal contraceptives, possible fear of side effects, and possible increased condom use (14).

The findings of this review must be seen in light of several limitations. First, most of the included studies were conducted prior to the policy inclusion of PITC following the WHO guidelines in 2007 (1). Although several countries such as Botswana, Lesotho, and Kenya had PITC-like policies in place at the time WHO issued its guidance, studies conducted prior to this period may have been different than those conducted afterwards, and many were not explicitly attempting to evaluate PITC. While we included these studies in this review in an attempt to gather all evaluations of studies that were conducted in a manner that could be considered PITC, these studies may be different than later studies that conceptualized their approach to HIV testing as PITC, perhaps supported by international or national guidelines. Over time, more studies conducted after the 2007 WHO guidelines will be published and contribute to the evidence base for PITC. WHO started reporting the extent of PITC service provision in 2008 (32).

Second, although we included a variety of study designs in the review, only one study was a group randomized trial. As a previous commentary has noted, it is difficult to infer causality without randomized designs, and further, it is difficult to evaluate generalizability as PITC requires adaptation to local contexts and there is a wide variation in programs' definitions of what constitutes PITC (33).

Third, newer studies that used rapid HIV testing with same-day return of results may have higher rates of uptake of HIV testing and return for test results than older studies where clients had to return a week or more after pre-test counseling for results. However, only one of the studies included in this review specifically noted a change in testing procedures over the course of the study; presumably most of the rest of the studies that compared PITC to other testing modalities used the same form of testing, so this would not bias individual study results.

Overall, findings from this review support the continued roll-out of provider-initiated testing and counseling. PITC clearly improves HIV testing uptake across settings. While the impact of PITC on other outcomes is more mixed, few studies showed effects in the opposite direction as intended, and in general, PITC appears to generally lead to at least as much behavior change as CITC.

Future studies should include a focus on the messages provided in post-test counseling. In general, most studies included in this review provided little description of the post-test counseling conducted. Post-test counseling is an important part of PITC, as it provides an opportunity for clients to learn about HIV-related prevention, treatment, care and support services. Limited or inconsistent post-test counseling might potentially be a reason for some of the mixed outcomes identified in this study. Post-test counseling should be as in-depth for PITC as it is for CITC. Further, providers should be adequately trained in basic, client-centered counseling, or trained counselors should administer both pre- and post-test counseling sessions.

The potential benefits of PITC must be weighed in different settings with the costs of introducing PITC, particularly in terms of providers' time. PITC is an approach meant to be implemented in health settings. Therefore, the WHO PITC guidance does not address testing for those not attending health settings, particularly adolescents, men, and, in some settings, vulnerable and marginalized groups. We recommend a variety of different approaches to HIV testing, including both PITC and CITC, in order to achieve equitable coverage.

The 2007 WHO guidelines for PITC provide strong guidance for rolling out PITC in a variety of settings. As PITC is expanded in low- and middle-income countries, further studies are needed to continue to monitor the effect of PITC on a variety of outcomes.

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Figure 1.
Flow chart depicting disposition of study citations

Table 1

Study description table

Study	Setting	Population Characteristics	Intervention Description	Study Design	Results
Allen et al., 1992(13)	Rwanda Kigali	Child bearing women and their male partners Gender: 100% female Age: 20 – 40	Participants saw an HIV/AIDS educational video and participated in a discussion group led by a social worker and a physician. Women were given an HIV test upon study enrollment and their partners were offered an HIV test on a volunteer basis. Couples were encouraged to receive their results and post-test counseling together. Free health care was provided to participants. Testing was conducted with enzyme immunoassay, with positive results confirmed with either Western Blot or indirect immuno fluorescence for HIV-1.	Time-series study design. Assessments took place at baseline (N=1458) and at one and two years (N=NR) post-intervention. Participants were non-randomly selected.	HIV seroconversion rate per 100 person years: Before PITC: 4.1 (95% CI: 3.0, 5.1); After PITC: 3.0 (95% CI: 2.2, 3.7) Gonorrhea prevalence: BL: 13%; 12 month FU: 6%, p<0.05
Allen, Tice et al., 1992(15)	Rwanda Kigali	Serodiscordant couples attending prenatal and pediatric clinics Gender: NR Age: NR	Each couple saw an HIV/AIDS educational video and participated in a discussion group led by a Rwandan social worker. The educational video discussed the role of condoms and spermicide containing nonoxonyl 9 in AIDS prevention. Condoms, presented as the most effective HIV prevention method, and spermicidal suppositories were offered free of charge to all participants. At post-test counseling, a project counselor distributed HIV test results individually, in sealed envelopes, to preserve confidentiality. Couples were encouraged to receive their results together and discuss the implications of their HIV status with their counselor. Testing was conducted using enzyme linked immunosorbent assay (ELISA), with positive results confirmed by Western Blot.	Non-randomized individual trial study design. Assessments took place at baseline (N=NR) and quarterly for approximately 2.2 years (N=NR) post-intervention. Participants were non-randomly selected.	Condom use: BL: 4%; 12 month FU: 57%, p=NR
Allen et al., 1993(14)	Rwanda Kigali	Childbearing women Gender: 100% female Age: 18 to 35 years	Participants received pretest counseling consisting of a 35-minute AIDS educational video, followed by a group discussion led by a physician and social worker. HIV antibody test with posttest counseling, were given individually and confidentially. Women were obligated to receive their HIV test results. At enrollment and during each subsequent contact, participants were offered condoms and spermicides at no cost. The counseling session emphasized preventing heterosexual transmission and providing moral support for HIV-positive women. Time between testing and results was three weeks.	Time series study design. Assessments took place at baseline (N=1458), 12 months (N=1254) and 24 months (N=1352). Participants were randomly selected.	Hormonal contraceptive use: HIV - negative women: BL: 17%; 12-month FU: 18%, p=NR; HIV-positive women: BL: 23%; 12-month FU: 16%, p=NR
Bentley et al., 1998(16)	India Pune	Seronegative heterosexual males in STD Clinics in India Gender: 100% male Age: Median: 25 years	Participants received one-on-one pre-HIV test counseling which included information about the routes of transmission of the virus, high risk behaviors, prevention strategies, and a demonstration of the correct use of latex condom. Men were also counseled on abstinence or condom use with all sexual partners until their STD was	Time series study design. Assessments took place at baseline (N=1628), at 6 months (N=1367), 12 months (N=1136), 18 months (N=772), 24 months (N=499), and	Visited commercial sex workers: BL: 65%, 6-month FU: 16%; 24-month FU: 23%, p=NR Consistent ("always") condom use with sex workers: BL: 10%, 6-month FU: 36%; 12-month FU: 40%; 24-month FU: 41%, p=NR

Study	Setting	Population Characteristics	Intervention Description	Study Design	Results
Brou et al., 2009(17)	Côte d'Ivoire Abidjan	Range: 18 – 70 years Pregnant women aged 18+ whose HIV status was unknown Gender: 100% Female Age (Median; IQR): Overall: 26; 22–30 HIV+: 26; 23–30 HIV-: 25; 22–39	Women presenting at PMTCT clinics were given an HIV test. Both HIV+ and HIV- women were offered post-test and post-partum family planning during follow up visits. In addition, all women were offered information on, sexually transmitted infections (STIs) including HIV/AIDS, and condom use. After childbirth, they received free access to modern contraceptive methods (injectable contraceptives, contraceptive pill, condoms) beginning in the first post-partum month. Type of testing was not reported.	Time series study design. Assessments at baseline (N=980) and at 3, 6, 12, 18 and 24 months post-partum. Participants were non-randomly selected.	“Sometimes” condom use with sex workers: BL: 19%; 6-month FU: 16%; 12-month FU: 18%; 24-month FU: 18%; p=NR Use of modern contraception: HIV-positive: BL (any use in 2 years prior to pregnancy): 46%; 3-month FU: 41%; 6-month FU: 63%; 12-month FU: 65%; 18-month FU: 61%; 24-month FU: 52%; p=NR HIV-negative: BL (any use in 2 years prior to pregnancy): 51%; 3-month FU: 26%; 6-month FU: 65%; 12-month FU: 75%; 18-month FU: 73%; 24-month FU: 67%; p=NR
Chandisarewa et al., 2007(18)	Zimbabwe Harare/Chitungwiza	Pregnant women receiving antenatal care Gender: 100% female Age: NR	PMTCT clinic counselors held 15-minute group education and discussion sessions with pregnant women, using a structured flip chart as a discussion guide. The discussion focused on HIV transmission, PMTCT, sdNVP prophylaxis and routine HIV testing for all mothers, specifying the right to refuse. Women who did not refuse and gave verbal informed consent individually had blood drawn for rapid HIV testing. Pregnant women received their test results the same day during extensive individual post-test counseling, with a focus on PMTCT interventions for HIV-infected women, enrolment into support groups, counseling for exclusive breastfeeding for 6 months according to WHO and national guidelines, sdNVP prophylaxis and mother-infant follow-up. Community mobilization activities were also conducted.	Serial cross-sectional study design. Assessments took place for a six month period in 2004–2005 during opt-in testing (N=4872) and for a subsequent six month period in 2005 during opt-out testing (N=4551). Participants were non-randomly selected.	Tested for HIV: Opt-in: 65.1%; Opt-out: 99.9%, p<0.001 Received post-test counseling and collected results: Opt-in: 96.9%; Opt-out: 99.8%, p<0.001 Partners who received HIV testing: Opt-in: 6.4%; Opt-out: 6.8%, p=NS Partners who received post-test counseling: Opt-in: 100%; Opt-out: 99.7%, p=NS HIV-positive women who received post-test counseling and collected results: Opt-in: 95%; Opt-out: 98%, p<0.001 HIV-positive women known to have delivered in ANC clinics: Opt-in: 38.1%; Opt-out: 27.6%, p<0.001 HIV-positive women given single dose nevirapine: Opt-in: 76.3%; Opt-out: 71.6%, p=NS HIV-exposed infants given single dose nevirapine: Opt-in: 36%; Opt-out: 28%, p=NS
Creek et al., 2007(19)	Botswana Francistown	Pregnant women seeking ANC Gender: 100% female Median age: “Voluntary” Testing group = 23 Routine Testing group = 22.5	The study compared two types of PITC: opt-in (referred to as voluntary) and opt-out (referred to as routine) Voluntary/Opt-In: Midwives providing routine ANC offered HIV testing for PMTCT. In late 2002, lay counselors (secondary school graduates with 4 weeks of counseling training) were employed to provide dedicated counseling services for PMTCT in public clinics. Authors do not specify if the lay counselors’ participation supported or replaced that of the midwives. Routine/ Opt-Out: Testing routine but not compulsory, with healthcare workers testing for HIV unless the client refused. Clinic staff who provided pretest counseling were	Serial cross sectional study design. Data collected at 4 clinics during voluntary/opt-in period (N=492) and 8 months later, after a routine/opt-out policy was instituted (N=964). Participants were non-randomly selected – all women presenting at the ANC clinic during the study periods were included in the sample.	New ANC clients per month: Opt-in: 111; Opt-out: 121, p=NR HIV testing (clinic-recorded): Opt-in: 76%; Opt-out: 95%, p<0.001 HIV testing (self-reported): Opt-in: 69.4%; Opt-out: 92.3%, p<0.001 Received HIV test results: Opt-in: 72%; Opt-out: 82%, p<0.001 Returned to clinic for ANC after testing: Opt-in: 86%; Opt-out: 89%, p=NS PMTCT knowledge (mean correct answers): Opt-in: 7.4; Opt-out: 8.2, p<0.001

Study	Setting	Population Characteristics	Intervention Description	Study Design	Results
Desgrees-Du-Lou et al., 2007(20)	Côte d'Ivoire Abidjan (Abobo and Yopougon districts)	Pregnant women attending ANC Gender: 100% female Age: Range : 18–35+	trained to conduct group or individual pretest educational sessions with a flip chart and were provided with scripts on how to introduce the HIV test as part of a package of routine ANC. The flip chart included basic information about HIV transmission, PMTCT, and ARV therapy; a brief explanation of all tests done during ANC (hemoglobin, syphilis, HIV, glucose, and blood pressure); and a statement that all tests are routine but that patients have the right to refuse tests they do not want. Group discussion was encouraged by questions provided on the flip chart. Patients who did not want any of the tests were instructed to speak with the counselor. Clients told to return for results in 1 month (ELISA) / 1 week (rapid test). After receiving results, posttest counseling was given to HIV– and HIV+ women.		Think all pregnant women should test for HIV: Opt-in: 94.6%; Opt-out: 100%, p=NS HIV-positive women who know how to receive ART: Opt-in: 21.9%; Opt-out: 68.4%, p=NS HIV-positive women who are aware of local HIV support organizations: Opt-in: 45.6%; Opt-out: 68.4%, p=NS HIV-positive women who began AZT: Opt-in: 70%; Opt-out: 66%, p=NS HIV-positive women who are interested in a support group: Opt-in: 84.5%; Opt-out: 94.7%, p=NS HIV-positive women who disclosed to partners: Opt-in: 63%; Opt-out: 61.1%, p=NS HIV-positive clients who disclosed to families: Opt-in: 34.2%; Opt-out: 62.5%, p=0.04 HIV-positive women who report domestic violence after serostatus disclosure: Opt-in: 6.1%; Opt-out: 0%, p=NS
			Participants received prenatal/HIV counseling and were offered HIV testing. Women who accepted the HIV test and who were HIV-infected entered into the PMTCT program. HIV-negative women and women who refused to be tested for HIV were offered a reproductive health oriented follow-up, with one visit to the health center every 6 months for the 2 years following the delivery. Type of testing was not reported.	Prospective cohort study design. Assessments took place at baseline (N=937) and 18 months (N=754). Participants were non-randomly selected.	Ever used condoms with regular partner: HIV-positive: BL: 23.2%; FU: 48.8%, p<0.01; HIV-negative: BL: 36.4%; FU: 58.7%, p<0.01; Refused testing: BL: 51.9%; FU: 57.1%, p=NS Ever discussed STIs with regular partner: HIV-positive: BL: 28.4%, FU: 65%, p<0.01; HIV-negative: BL: 65.1%, FU: 96.6%, p<0.01; Refused testing: BL: 67.3%; FU: 90.4%, p=NS Disclosure to regular partner of HIV test result (if tested) or of being offered an HIV test (if refused testing): HIV-positive: 42.8%; HIV-negative: 97.4%; Refused testing: 80.8%, p=NS Suggested regular partner undertake HIV testing: HIV-positive: 71.6%; HIV-negative: 96.6%; Refused testing: 90.4%, p=NS Suggested regular partner use condoms in case of extra conjugal relationships: HIV-positive: 58.2%; HIV-negative: 94.3%; Refused testing: 92.3%, p=NS
Harris et al., 2008(21)	Zambia Lusaka	TB patients who were offered HIV testing Gender: NR Age: NR	HIV diagnostic counseling and testing (DCT) focuses on the clinical requirement to know a patient's status in order to provide optimal medical care. Group education sessions in the waiting area of the TB department provide information on TB-HIV co-infection, medical benefits of knowing one's HIV status and the importance of HIV	Serial cross-sectional study design. ART enrollment of TB/HIV co-infected adults were compared 3 months before implementation and 3 months after	ART patients co-infected with TB: BL: 13.1%; FU: 17.8%, p=NR

Study	Setting	Population Characteristics	Intervention Description	Study Design	Results
Huerga et al., 2010(22)	Kenya Homa Bay District, western Kenya	All patients registered for TB treatment at pre-set study intervals in TB clinic of Homa Bay District Hospital Gender: NR Age: NR	HIV testing and counseling were provided at the TB clinic along with HIV prevention education. All services linked to the HIV care of HIV-positive TB patients, such as CD4 monitoring, cotrimoxazole prophylaxis and ART initiation or continuation, were delivered from the TB clinic. HIV testing was performed using two rapid tests in succession.	Serial cross sectional study design. Assessments took place at Baseline n=409; follow up 1 at 12 months (N=437); follow up 2 at 18 months (N=447). Follow-up periods were given as ranges: Baseline – Jan–Jun '05 1st follow up – Jan–Jun '06 2nd follow up – Jan–Dec '07 Participants were non-randomly selected.	HIV/TB co-infected patients receiving cotrimoxazole prophylaxis: BL: 47%; 12-month FU: 93%; 18-month FU: 86%, p<0.01 HIV-positive patients requiring ART receiving ART: BL: 9%; 12-month FU: 46%; 18-month FU: 41%, p<0.01 TB program success rate: BL: 56%; 12-month FU: 58%; 18-month FU: 71%, p<0.01 TB program death rate: BL: 8%; 12-month FU: 10%; 18-month FU: 3%, p<0.01 TB program transfer rate: BL: 16%; 12-month FU: 9%; 18-month FU: 6%, p<0.001 TB program failure rate: BL: 0%; 12-month FU: 1%; 18-month FU: 1%, p=NS TB program default rate: BL: 20%; 12-month FU: 21%; 18-month FU: 18%, p=NS TB smear-negative patients: BL: 42%; 12-month FU: 37%; 18-month FU: 40%, p=NS
Khoshnood et al., 2006(23)	China Urumqi City, Tianshan and Shui Districts	Pregnant women and their male partners attending antenatal care at urban hospitals Gender: 50% male 50% female Age: Mean Control: 27.4 Mean Intervention: 28.2 Range: 21–34	Participants either received couples PITC or individual PITC, where the pregnant woman only received PITC. The intervention for both the couple and individual PITC included a 15 minute pre-test counseling session plus a 1 week follow-up post-test counseling session where the participant could find out his/her test results. Further information on type of testing was not reported.	Group randomized trial with comparison group. Assessments took place at baseline (N=600) and after approximately one week for follow-up (N = 600). Participants were non-randomly selected.	Willingness to be tested for HIV: Individual PITC: BL: 15%; FU: 51%, p<0.01; Couples PITC: BL: 7%; FU: 42%, p<0.01; Individual vs. Couples PITC at FU: OR: 1.42 (95% CI: 0.89, 2.26) HIV-related knowledge: 18 individual knowledge measures, all results positive and statistically significant or no change (data not shown)
Kiene et al., 2010(24)	Uganda Mpigi district	Sexually active Ugandan adults in an outpatient clinic Gender: 48.6% male 51.4% female Age: Mean: 35.2 years	Participants gave written informed consent, were seen by the clinician in the outpatient clinic, received pretest information about the routine HIV test, had their blood drawn for the HIV test, and then were escorted back to clinical staff to receive their rapid HIV test results and individual posttest counseling. Determine HIV-1/2 Assay test kits were used for rapid testing; positive results were confirmed using Clearview HIV-1/2 STAT-PAK and Uni-Gold HIV as a tie-breaker.	Before/after study design. Assessments took place at baseline (N=245) and at 3 months (N=215) post-intervention. Participants were non-randomly selected.	Engaged in risky sex: HIV-positive: BL: 75.0%; FU: 53.5%; HIV-negative: BL: 70.1%; FU: 50.3%; Combined BL to FU: OR: 0.15 (95% CI: 0.07–0.36) Know partner(s)' HIV status: HIV-positive BL: 14.3%; FU: 35.7%; HIV-negative: BL: 18.7%; FU: 34.3%; Combined BL to FU: OR: 5.13 (95% CI: 1.67–15.82)

Study	Setting	Population Characteristics	Intervention Description	Study Design	Results
Moses et al., 2008(25)	Malawi Lilongwe	Pregnant women accessing ANC Gender: 100% female Age: NR	In April 2005 'opt-out' testing was instituted. All women received health education in the waiting area where opt-out testing was explained, then moved into smaller groups of eight for pretest counseling and then to a private room for routine antenatal care. If the woman verbally consented, blood was obtained for the rapid test. Post-test counseling was done individually. Testing was initially conducted with ELISA with test results returned 1–2 weeks later. In July 2003, two parallel rapid HIV tests replaced the use of ELISA.	Serial cross-sectional study design. Data for assessments were collected retrospectively for monthly reports but assessments were reported quarterly or annually. Participants were non-randomly selected.	HIV testing among pregnant women: Opt-in: 45%; Opt-out: 99%, $p<0.001$ HIV testing among HIV-exposed infants: Opt-in: 19.4%; Opt-out: 34.5%, $p<0.001$ Facility delivery: Opt-in: 23.5%; Opt-out: 54.6%, $p<0.001$
Pang et al., 2007(26)	China Sichuan, Yunnan, Guizhou, Guangxi, Zhejiang	Injection drug users in methadone maintenance treatment Gender: 100% female 1 st survey: 77.1% male; 22.9% female 2 nd survey: 74.5% male; 25.5% female 3 rd survey: 73.3% male; 26.7% female Age: 1 st survey: mean = 32.5 2 nd survey: mean = 33.3 3 rd survey: mean = 33.0	Participants received methadone maintenance treatment (MMT) in one of eight MMT clinics. HIV testing and counseling was offered after one month of entry into the MMT program and again (for those tested negative) at 12 months into the program. Testing was conducted using ELISA, with positive results confirmed by Western Blot.	Serial cross-sectional study design. Assessments took place at baseline (N=585), at approx 4 months (N=609) and at approximately 12 months post-intervention (N=468). Participants were non-randomly selected.	Injection drug use in past month: Data NR, decrease from BL to FU; $p<0.01$ Drug-related criminal activities BL: 20.7%; 4-month FU: 3.6%; 12-month FU: 3.8%, $p<0.01$ Employment: BL: 22.9%; 4-month FU: 43.2%; 12-month FU: 40.6%, $p<0.01$ Harmonious family relationships: BL: 49.6%; 12-month FU: 65.8%, $p<0.01$
Stringer et al., 2003(27)	Zambia Lusaka	Pregnant women Gender: 100% female Age: Mean age in targeted group: 25.6 Mean age in universal group: 25.6	Eligible women received an educational message in a group session. In the targeted strategy, women were counseled and offered voluntary HIV testing. Those who accepted testing and were found to be HIV infected were then offered enrollment into the clinical trial. After informed consent was obtained, participants were issued a single 200-mg NVP tablet to take home, with instructions to ingest it at the onset of labor. When participants presented in labor, they were asked whether they had taken their NVP tablet and, if so, at what time. Those who reported not having taken it were issued another one immediately. Type of testing was not reported.	Group randomized trial. Assessments took place at baseline (N=246) and post-partum (N=201) post-intervention. Participants were non-randomly selected.	Non-adherence to nevirapine: Universal: 39%; Targeted: 26%, $p=0.044$ No nevirapine detected in cord blood: Universal: 31%; Targeted: 23%, $p=NS$ Nevirapine uptake: Universal vs. Targeted AOR: 1.5 (95% CI: 1.1–2.1)
Van Rie et al., 2008(28)	Democratic Republic of Congo	TB patients Gender: 51.8% male 48.2% female Age:	Participants received one of three models of provider-initiated HIV counseling and testing (CT) for TB patients, corresponding to three levels of referral: referral to an off-site freestanding VCT center (Model 1), on-site referral for HIV CT to a CT center at the primary health care center to which the TB clinic belongs (Model 2) and routine HIV	Non-randomized group trial with multiple comparison groups. Assessment took place at baseline (N=1238) and post-intervention (N=1187)	HIV testing: Routine: 97.7%; On-site referral: 94.8%; Off-site referral: 68.5%, $p<0.001$ Received post-test counseling: Routine: 95.0%; On-site referral: 97.3%; Off-site referral: 100%, $p=0.002$ HIV-positive individuals who started cotrimoxazole treatment: Routine: 91.0%;

Study	Setting	Population Characteristics	Intervention Description	Study Design	Results
van't Hoog et al., 2005(29)	Kinshasa	Mean: 31 years Pregnant women accessing ANC Gender: 100% female Age: NR	CT by the TB nurse (Model 3). Rapid HIV testing was conducted using Determine HIV-1/HIV-2. Original/ Opt-in PITC: Staff members (mainly nurses and nurse-midwives) were trained in PMTCT. HIV testing and counseling presented as optional "opt-in" service. General information on HIV and PMTCT provided to nearly all women, but counseling was provided in a separate location within the hospital. Revised/ Opt-out PITC: Staff members were trained in PMTCT. All first-time ANC clients received ANC examinations and pretest HIV counseling from an ANC nurse-counselor. The same nurse-counselor also provided posttest HIV counseling and routine ANC preventive interventions upon collection of laboratory results. Same day testing was provided.	Participants were non-randomly selected. Serial cross sectional study design. Population measured during opt-in period (n=4142) and revised/opt-out period of PITC (n=4089). Participants were non-randomly selected.	On-site referral: 93.5%; Off-site referral: 81.1%, p=NS Received pre-test counseling: Opt-in: 77%; Opt-out: 92%, p<0.001 Accepted HIV testing: Opt-in: 80%; Opt-out: 83%, p<0.001 Received post-test counseling: Opt-in: 89%; Opt-out: 90%, p=NS Women attending their first ANC visit who learned their HIV test results: Opt-in: 55%; Opt-out: 68%, p<0.001 Nevirapine uptake: Opt-in: 57%; Opt-out: 70%, p<0.001
Wiktor et al., 2004(30)	Côte d'Ivoire Abidjan	Newly diagnosed TB patients at treatment centers Gender: 68.5% male 31.5% female Age: 29 (median)	Medical staff, with previous training, provided HIV counseling and testing to patients, either individually or in groups of two to five. Each session lasted 10 to 15 minutes. Consent for HIV testing was requested privately from each patient. Post test counseling was provided, 2 months after the initiation of TB therapy, by a physician on the tuberculosis clinic staff. These physicians had not received specific training in the post test counseling methods. Type of testing was not reported.	Time series study design. Assessments at baseline (N=559) and 4 month follow-up (N=367). Participants were non-randomly selected.	HIV knowledge (responded correctly to all 5 questions): BL: 27.9%; FU: 60.2%, p<0.01. HIV knowledge at 4-month FU: Accepted testing: 64.2%; Refused testing: 52.6%, p=0.04 Consistent condom use: Men: BL: 9.9%, FU: 23.6%, p=0.001; Women: BL: 6.3%; FU: 9.5%, p=NS Consistent condom use at 4-month FU: Men: Accepted testing: 25%; Refused testing: 21%, p=NS; Women: Accepted testing: 15%; Refused testing: 3%, p=NS
Xu et al., 2002(31)	Thailand Chiang Rai Province	Clinic-based population of women of reproductive age in Northern Thailand Gender: 100% female Age: Median 27 years	Pre-test and Post-test Counseling: Each woman was counseled according to her risk profile at enrollment and at each follow-up visit (6 and 12 months). Counseling covered partner communication, partner HIV testing, and condom use by steady partners. Counseling sessions lasted for 20 to 45 minutes. Rapid testing was conducted.	Time series study design collecting data at enrollment (N=779), 6 months (N=732), and 12 months (N=716) follow-up. Participants were non-randomly selected.	Communication about condom use: BL: 19%; 6-month FU: 89%, p<0.05; 12-month FU: 78%, p<0.05 Communication about HIV test for husband: BL: 35%; 6-month FU: 94%, p<0.05; 12-month FU: 91%, p=NS Communication about HIV risk from husband: BL: 66%; 6-month FU: 94%, p<0.05; 12-month FU: 91%, p=NS Consistent condom use (100%): BL: 2%; 6-month FU: 5%, p<0.05; 12-month FU: 5%, p=NS Condom use "most times" (50-99%): BL: 1%; 6-month FU: 2%, p=NS; 12-month FU: 4%, p=NS Condom use "sometimes" (1-49%): BL: 6%; 6-month FU: 41%, p<0.05; 12-month FU: 21%, p<0.05

Table 2

Study rigor assessment

Study	Cohort	Control or comparison group	Pre/post intervention data	Random assignment of participants to the intervention	Random selection of participants for assessment	Follow-up rate of 80% or more	Comparison groups equivalent on socio-demographics	Comparison groups equivalent at baseline on outcome measure
Allen et al., 1992(13)	Yes	No	Yes	No	No	Yes	NA	NA
Allen, Tice et al., 1992(15)	Yes	Yes	Yes	No	No	NR	No	NR
Allen et al., 1993(14)	Yes	No	Yes	NA	Yes	Yes	NA	NA
Bentley et al., 1998(16)	Yes	No	Yes	NA	No	No	NA	NA
Brou et al., 2009(17)	Yes	No	Yes	No	No	NR	NA	NA
Chandisarewa et al., 2007(18)	No	Yes	Yes	NA	NA	NR	NR	NA
Creek et al., 2007(19)	No	No	Yes	No	No	NA	NA	NA
Degrees-Du-Lou et al., 2007(20)	Yes	Yes	Yes	No	No	Yes	No	No
Harris et al., 2008(21)	No	No	Yes	NA	No	No	NA	NA
Huerga et al., 2010(22)	No	No	Yes	No	No	NR	NR	NR
Khoshnood et al., 2006(23)	Yes	Yes	Yes	Yes *	No	Yes	Yes	No
Kiene et al., 2010(24)	Yes	No	Yes	No	No	Yes	NR	NR
Moses et al., 2008(25)	No	No	Yes	No	No	NA	NR	NR
Pang et al., 2007(26)	No	No	Yes	No	No	NR	No	NR
Stringer et al., 2003(27)	Yes	Yes	Yes	Yes	No	Yes	No	NR
Van Rie et al., 2008(28)	No	Yes	No	No	No	NR	No	NR
van't Hoog et al., 2005(29)	No	No	Yes	No	No	NA	NR	NA
Wiktor et al., 2004(30)	No	Yes	No	No	No	No	No	NA
Xu et al., 2002(31)	Yes	No	Yes	No	No	Yes	NA	NA