HIV testing services

Key points

▪ Studies have found that many individuals who undergo HIV testing and counselling (HTC) and discover they are HIV-positive change their risk behaviours to avoid transmitting HIV to others. People living with HIV have fewer sexual partners on average and make greater use of condoms after their diagnosis than before.

▪ Programmes where couples test and are counselled together help couples adopt HIV preventive behaviours.

▪ The effect of HTC may be more pronounced for those who learn that they are in a serodiscordant partnership. Nonetheless, some of these changes may still be modest or temporary.

▪ Most studies have been unable to detect large changes in risk behaviours or decreased incidence of new infections for individuals who receive an HIV-negative test result. Nevertheless, some studies have reported positive effects of HTC on sexual risk reduction. The impact may vary according to the population, setting, style of counselling and modality of the testing intervention.

The majority of HTC followed the voluntary counselling and testing (VCT) model until 2007, when the World Health Organization (WHO) published guidelines on provider-initiated testing and counselling (PITC) (3). Both models will be discussed below.

Further discussion will highlight evidence on the specific contribution that pretest and post-test counselling make to behaviour change beyond providing a test and results. After that, the emerging evidence for HIV self-testing and the effects of HIV-positive test results on behaviour will be discussed, followed by operational and population-specific evidence.

In 2015, WHO launched consolidated guidance on HTS (4). The term has since been used as the overarching name for this field of work, describing the full range of services that should be provided together with HIV testing. “HTC” is used to refer to modalities that provide both testing and counselling.

For the purposes of this document, the term “HTS” will be used unless reference is made to specific types of HIV testing interventions, in which case the appropriate term will be used.
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The effect of voluntary HIV counselling and testing on sexual behaviour

What does the evidence say about the effect of VCT on sexual behaviour?

▪ It can contribute to reductions in the number of sexual partners.
▪ It increases the odds of condom use among those testing HIV-positive.
▪ It is associated with fewer sexual partners and increased use of condoms in serodiscordant couples.
▪ Couples testing in serodiscordant couples shows decreases in unprotected sex.
▪ Community-based HTC programmes can affect prevention outcomes if they are focused on populations where positivity in HIV testing is high.

The voluntary counselling and testing model

VCT consists of the provision of counselling and risk evaluation by a trained counsellor prior to HIV testing. It requires an individual to seek testing, either at a VCT facility or a mobile VCT site. An HIV test is then administered and the result is delivered by the counsellor.

The next step in VCT is post-test counselling, which contains an element of risk reduction counselling. The duration of counselling may vary, and the test result may either be given on the same day (rapid testing) or individuals may return to the clinic another day to receive their test result. While post-test counselling is intended to be used both for those who are HIV-negative and those who are HIV-positive, it is often truncated or less intense for people who test HIV-negative.

One of the main intentions of VCT has been preventive: it can help people change their sexual behaviour to avoid acquiring or transmitting HIV, and it can help to keep HIV-negative partners in serodiscordant couples from acquiring HIV. Studies have reported a reduction in the number of sexual partners and an increase in condom use, including among serodiscordant couples, following couples testing (5).

A 2012 meta-analysis updating a previous meta-analysis from 1990–2005 identified 17 studies conducted in low- or middle-income countries that reported on behavioural outcomes following a VCT intervention (5). In the systematic review, the analysis focused on a number of reported outcomes: HIV incidence, STI incidence or prevalence, and positive and negative life events. A meta-analysis of eight of these studies was conducted on two outcomes: condom use/protected sex and number of sex partners.

Main findings from the meta-analysis showed that the participants who received VCT were approximately 30% less likely to report an increased number of sexual partners compared to those who did not receive the intervention (odds ratio [OR] = 0.69; 95% confidence interval [CI]: 0.53–0.90; P < 0.01). There was a significant increase in the odds of condom use/protected sex among participants receiving a VCT intervention after stratification by HIV status, with HIV-positive participants having 3.24 times higher odds of reporting condom use/protected sex compared to HIV-negative participants (95% CI: 2.29–4.58; P < 0.001).
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A previous meta-analysis included many of the earlier studies in the 2012 review, but it reached partially different conclusions (6). Similar to the 2012 analysis, findings showed that study participants receiving VCT interventions were less likely to report unprotected sex compared to participants who had not received VCT. This finding was not stratified by HIV status (OR = 1.69; 95% CI: 1.25–2.31; P < 0.01). Unlike the 2012 analysis, however, VCT had no significant effect on the number of sex partners (OR 1.22; 95% CI: 0.89–1.67; P > 0.05). However, the analysis in the earlier review included VCT interventions covering researcher-, client- and provider-initiated methods, as the distinction between those models of HTS delivery had not yet been made so clearly.

Most of the studies in the 2012 review were conducted in clinic-based settings, although a few reported on testing conducted in a workplace, by mobile outreach teams or at home. Eleven of these studies were conducted in African countries, with the remainder in the Asia–Pacific region and the Caribbean. Generally, follow-up was for a year or less, so the findings reflect risk behaviours in the short term (5).

Little measurable effect of voluntary counselling and testing on HIV or STI incidence or prevalence

Three studies included in the 2012 review attempted to measure changes in HIV incidence before and after HIV testing, or by contrasting those who received HTC in different venues or under different circumstances (5). Corbett et al. compared participants in Zimbabwe receiving rapid on-site HIV tests through places of employment to those receiving vouchers for HIV testing through an external provider (7). No difference in HIV incidence was found, although the uptake of VCT was much higher in the on-site testing group than in the group receiving vouchers (70.7% versus 5.2%).

In Uganda, Matovu et al. found no difference in HIV incidence between those accepting VCT (incidence rate [IR] = 1.6 per 100 person-years [PY]) and those refusing it (IR = 1.4 per 100 PY; P = 0.6) (8). In another study in Zimbabwe, Machekano et al. followed a cohort of male factory workers (9). They discovered that men who completed VCT and chose to get their test results had higher HIV incidence (IR = 3.29 per 100 PY; 95% CI: 2.31–4.56) than those who chose not to receive their results (IR = 1.76 per 100 PY; 95% CI: 1.01–2.86). Among those who did receive their test results, however, HIV incidence was lower in the period after obtaining the results (IR = 3.04 per 100 PY; 95% CI: 1.86–4.70) than the period before (IR = 4.82 per 100 PY; 95% CI: 2.75–7.81) (9).

Five studies included in the review also assessed changes in STI incidence or prevalence. Arthur et al. found that reported STI symptoms were 60% lower across all clinics six months after individuals received VCT compared to the baseline (10). Other studies generally found no difference, except Machekano et al., who reported an increase in STI incidence among those who went through HCT and received their test results compared to those who did not receive their test results (9).

In addition, three studies included in the 2012 review by Fonner et al. measured the effects of VCT on subsequent positive and negative life events (5). All three studies found that the effects on life events were limited, that positive life events were more common and that negative life events were rare. Disclosure of negative test results was more common than disclosure of positive test results in all three studies.
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A systematic review in sub-Saharan Africa found that there was no consistent evidence for the effect of individual HTC on HIV acquisition, but that couples testing and counselling was more effective (11).

**Voluntary counselling and testing reduces sexual partners**

Although none of the studies in the 2012 Fonner et al. review were able to show reductions in HIV incidence, other changes in preventive behaviours were found (5). Changes in both the number of sexual partners and condom use were examined in the meta-analysis. Six studies in the review reported on changes in the number of sexual partners following VCT, either comparing the same individual over time or comparing those receiving VCT to those who did not (5). Five of these studies were meta-analysed and the pooled random effects OR was 0.69 (95% CI: 0.53–0.90; \( P = 0.007 \)). This indicates that individuals who did not receive VCT in these studies had more sexual partners than those who did. When the effect was stratified by serostatus, the pooled random effects OR was 0.61 (95% CI: 0.37–0.997; \( P = 0.048 \)) for those who were HIV-positive, and 0.90 (95% CI: 0.77–1.10; \( P = 0.195 \)) for those who were HIV-negative. No statistically significant difference was found between males and females. All studies showed a trend towards a reduced number of partners following VCT; none showed the opposite effect (5).

**Voluntary counselling and testing increases the odds of condom use, especially for people who are HIV-positive**

Thirteen of the studies analysed in the Fonner et al. review reported changes in condom use or protected sex following VCT (5). Seven reported on similar measures, allowing for a meta-analysis.

The overall effect across all studies was positive but not statistically significant. No effect was found by gender: men and women were equally likely to use condoms following VCT. When stratified by HIV status, however, the overall effect of VCT on condom use was positive and statistically significant (OR = 3.24; 95% CI: 2.29–4.58; \( P < 0.49 \)). Individuals who received VCT and a positive test result had a greater chance of using condoms than HIV-positive individuals who did not receive VCT, although Fonner et al. caution that this finding is based on only two studies. One study in the meta-analysis found that condom use decreased, but self-selection bias appears to be a factor (8).

The authors of the Fonner et al. review conclude that “results from this review and meta-analysis bolster the growing evidence that VCT reduces risky behaviors related to HIV by significantly reducing the number of sex partners of participants” (5). They further observed that “people living with HIV who received VCT exhibited increased odds of using condoms and engaging in protected sex than people living with HIV who did not receive VCT” (5). As summarized in the conclusions for HTS below, results are more consistent for people who test HIV-positive than for those who do not.

**Couples testing can decrease unprotected sex if couples are serodiscordant**

Couples testing programmes invite couples to be counselled and tested together; they also promote mutual disclosure of test results and allow the counsellor to explore the implications of test results with the couple (12). The available evidence shows that this approach may be more effective than individual VCT.
In one study, those who were tested as couples had less unprotected sex with their partner if they were serodiscordant (OR = 0.72; 95% CI: 0.53–0.99) (13). For those testing as individuals, however, no differences in condom use were found, but a weak effect was found in the intervention communities for individuals living with HIV who reported fewer sexual partners and a lower likelihood of having multiple partners than individuals without HIV. These effects were more pronounced among men.

A similar effect can be seen in data from a programme in Zambia that followed 963 heterosexual couples after couples testing revealed that the partnership was serodiscordant (14). Before testing, less than 3% of couples reported current condom use with each other. While the frequency of sex did not change one year after VCT exposure, the proportion reporting condom use was greater than 80%, and it remained stable at that level over one year of follow-up. In contrast, among couples where both partners were HIV-negative, reported condom use was lower (28%). A biological measure (testing of vaginal smears for sperm), however, suggests that condom use among serodiscordant couples was partially inconsistent.

A study in South Africa found that behaviour change among serodiscordant couples occurred as rapidly as within a week of diagnosis (15).

**Community-based HIV testing can modestly affect prevention outcomes**

Two large cluster randomized trials of community-based testing interventions in low- and middle-income countries have appeared since the publication of the 2012 Fonner et al. review (5). Both suggest that intensive, community-based HIV testing interventions can have a modest impact on prevention outcomes (15, 16). Importantly, both trials assessed the diffusion of testing behaviours, measuring their outcomes through community surveys once the interventions were over. People taking part in the surveys had not necessarily had any prior contact with the intervention, but they had lived in a community where it had been provided and promoted.

Project Accept—a multisite effort that enrolled 48 communities in South Africa, Thailand, the United Republic of Tanzania and Zimbabwe—provided community-based mobile VCT as part of a wide-ranging package of activities focused on the whole community (16). The services provided included community mobilization and post-test support services. Communities were randomized to receive either the package of community-based VCT that included support services after testing (the intervention group) or the standard clinic-based counselling and testing (the control group). A post-intervention behavioural survey was conducted with 56 683 people aged 18 to 32 years (the peak age range for HIV infection in those settings).

The intervention’s primary outcome measure was HIV incidence, estimated through anonymous testing during the behavioural survey. In the intervention groups, it was 1.52% per year, compared to 1.81% in the control communities (16). The relative risk (RR) of infection was 14% lower, although the difference was not statistically significant (RR = 0.86; 95% CI: 0.73–1.02).

In sub-group analysis, the intervention had the greatest impact on women aged 25 to 32 years: their incidence was 30% lower, a significant difference (RR = 0.70; 95% CI: 0.54–0.90). HIV infections did not decrease in younger women or men (those aged 18 to 24 years) (16).
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Project ACCEPT also found no differences in condom use, but individuals living with HIV in the intervention communities did report fewer sexual partners, and they were less likely to have multiple partners (16). These effects were most pronounced among men.

The second study was a cluster randomized controlled trial of a home-based counselling and testing intervention in rural South Africa (17). This trial was conducted in a low-income district where many men had left in order to seek work, leaving most households headed by women. Clusters of households were randomized and offered either home-based testing (intervention group) or clinical-based HTC (control group).

The impact was measured through a household survey, which was conducted at the end of the project with 4154 local residents, two thirds of whom were female (17). The researchers reported an overall beneficial impact on sexual behaviour and HIV testing rates. Individuals in intervention communities were 45% less likely to report having had a casual partner in the past three months (prevalence ratio [PR] = 0.55; 95% CI: 0.42–0.73). Moreover, they were 55% less likely to report multiple partners (PR = 0.45; 95% CI: 0.33–0.62). The intervention had no measurable effect on condom use or HIV knowledge, which were similar in both arms of the study after the intervention. The effect of the intervention on HIV incidence was not measured in this study.
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The effect of provider-initiated testing and counselling on sexual behaviour

What does the evidence say about the effect of PITC?

▪ It results in increased testing coverage by a large degree.
▪ It led to a modest increase in condom use in some studies.
▪ It encourages women to discuss sexual health with partners.
▪ It leads to participants minimizing high-risk sexual behaviour (i.e., unprotected sex with a partner of different or unknown HIV status).

Since 2007, a clear distinction has been made between the VCT model discussed above and PITC (3). In PITC, HIV testing is included as part of the clinical services that individuals may receive when seeking care. Seeking out a testing facility is no longer a necessary step, so facilitating individual decision-making to be tested also may not be needed. Provider-initiated testing is more commonly provided in regions or among populations where HIV prevalence is high. As a result, the effects of PITC are likely to differ from those of standard VCT.

Provider-initiated testing and counselling increases testing coverage

A systematic review of PITC was published in 2012 by Kennedy et al. (18). This review considered whether testing provided in health-care settings at the initiative of providers had an effect on subsequent preventive behaviours (compared to testing sought at the initiative of the person being tested). The authors concluded that PITC increased the coverage of testing, often by a large degree, and that it also had a high positivity in HIV testing. As PITC is a gateway into extended treatment, care and prevention services, this outcome is valuable in and of itself.

Provider-initiated testing and counselling has modest effects on behaviour change

As with VCT, however, the evidence of the effect of PITC on other outcomes is mixed. Rates of reported condom use appeared to increase in some studies analysed, but not all of them (18). Acceptance of nevirapine (for the prevention of mother-to-child transmission of HIV) improved in one study (19), but not in two others that followed PITC (20, 21). Rates of partner testing apparently did not change.

Despite these mixed outcomes, few negative effects were found, making PITC on balance seem like a valuable way to increase testing coverage. This led Kennedy et al. to conclude that “in general, PITC appears to lead to at least as much behavior change as VCT” (18).

Some evidence of lower incidence of HIV and increased condom use, and more discussion among partners concerning sexual health

Much of the evidence for PITC comes from antenatal and reproductive clinics. An early study from Rwanda in the 1980s found that providing testing, an educational video and group discussion to women recruited from prenatal and paediatric clinics led to a significant
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A reduction of HIV incidence in women whose male partners also tested. There were also improvements in terms of gonorrhoea rates and condom use (22).

A programme offering testing to pregnant women in Côte d’Ivoire found that condom use with regular partners rose among both HIV-negative women (from 36.4% to 58.7%) and HIV-positive women (from 23.2% to 48.8%) after a postpartum period of 18 months (23). Those who chose not to test showed no such differences over time. The study also found that tested women were more likely to discuss sexual health with their partners after being tested, regardless of the test result.

However, changes in condom use may not always be durable, as shown by a study that offered testing and counselling to women in family planning clinics and a postpartum ward in Thailand. The proportion of women reporting any condom use was 6% prior to HIV testing, 41% six months later and 21% at 12 months total follow-up period (24).

A study examining sexual behaviour before and after PITC in a rural Ugandan outpatient clinic found that high-risk sex (unprotected sex with a partner of a different or unknown HIV status) was reported by fewer people three months after testing (25). Increased condom use appeared to play little role, most often because couples shared test results and found that they had the same HIV status, or because people newly diagnosed with HIV were not having sex at all.

As already highlighted, STI clinics may raise awareness among clients on ways to minimize high-risk sexual behaviour. PITC may be especially important in STI clinics. In a non-randomized study conducted among 1628 heterosexual men attending an STI clinic in Pune, India, men received pretest counselling that included the demonstration of correct methods of condom use. After the counselling, the study observed a decline in visits to female sex workers and an increase in consistent condom use among those who did visit sex workers (26).
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The effect of pre-test and post-test counselling on sexual behaviour

What does the evidence say about pretest and post-test counselling on sexual behaviour?

- There are modest changes in sexual behaviour, especially among gay men and other men who have sex with men.

As the PITC model has spread and increased the coverage of HIV testing, it offers the opportunity to unpack the effects that testing, knowledge of test results, and pretest and post-test counselling have on subsequent behaviour. Disentangling the effects and benefits of the two key components of HTC would be useful, and it perhaps may provide a basis for a rational allocation of effort and expense in providing this intervention.

As the preceding review of the evidence indicates, HTC approaches have a stronger effect on the behaviour of those who test positive than on those who test negative. However, definitive studies that conclusively answer the question of whether it is the knowledge of the test result, the counselling or a combination of the two that most affects post-test behaviour have not—and probably cannot—be conducted due to ethical concerns. As a result, the best answer to this question may come from examining the few studies that have experimented with pretest and post-test counselling. Due to the very heterogeneous quality and intensity of counselling, the findings presented here need to be interpreted cautiously, with consideration of the types of counselling provided in the respective studies.

Prevention counselling at the time of HIV testing has increased condom use and lowered STI incidence—but not always

In the 1990s, the Project Respect trial in the United States of America showed that prevention counselling at the time of HIV testing can have a positive impact on sexual risk behaviours and the incidence of new STIs (27). In this trial, more than 5700 self-reported heterosexual individuals who were HIV negative and attended STI clinics in the United States were randomized to one of three interventions: brief didactic messages, brief prevention counselling (two 20-minute sessions before and after the test) or more intensive prevention counselling (four sessions with a total duration of more than three hours).

At follow-up, self-reported condom use was somewhat higher among those who received counselling than those who received the brief didactic messages. After one year of follow-up, STI incidence was lower in the counselling groups: the rate was 11.5% among those who received enhanced counselling and 12.0% among those who received brief counselling, as opposed to 14.6% among participants who received the didactic messages (RR = 0.81; 95% CI: 0.67–0.98) (27).

The two counselling interventions were of similar effectiveness, which lent support to the use of the briefer intervention, and this was the model of risk reduction counselling subsequently promoted by the Centers for Disease Control and Prevention (CDC). Lowering STI incidence offers an appropriate indication of protected sex practices, suggesting that STI clinics could be an ideal gateway for VCT to affect HIV incidence through STI incidence, but further research is needed.
In a study conducted in the United States in 2010 and 2011, no apparent benefit of counselling was found (28). More than 5000 people attending STI clinics who took an HIV test were randomized to receive either a brief explanation of the HIV testing process or a 30-minute risk reduction counselling session, based on an evidence-informed model. Six months later, no statistically significant differences in STIs were found between the two groups, and new STI infections were actually higher among men who have sex with men who had received counselling. An analysis of the costs estimated that adding counselling more than doubled the per-patient costs (from US$ 23 to US$ 56).

The Voluntary HIV-1 Counselling and Testing Efficacy Study conducted in Kenya, Trinidad and the United Republic of Tanzania placed considerable emphasis on a similar model of risk reduction counselling in its intervention arm (13). Although it showed some benefits, especially for couples, it was not possible to separate the effects of testing and knowledge of serostatus from the effects of counselling in this study: those in the intervention arm received both, while those in the control arm received neither (13).

Two positive outcomes of pretest and post-test counselling, however, come from a pair of randomized studies among gay men and other men who have sex with men in the United States. These studies provided men in control groups with the more intensive counselling used in Project Respect; the intervention groups received an even more intensive approach. Both studies observed changes in sexual behaviour, and one of the studies reported a short-term reduction in HIV incidence in the intervention group (29, 30).

Similarly, a study of different models of HIV testing provision in drug and alcohol treatment centres found counselling had no impact on sexual risk behaviours, but that it was effective in reducing multiperson use of injecting equipment (31). A cost-effectiveness analysis found that the streamlined testing procedure increased life expectancy for people with HIV at a cost of US $60 300 per quality-adjusted life year (QALY), which is cost-effective in the United States. Another study found that adding risk reduction counselling increased testing costs without bringing additional benefits (32).

A trial conducted in primary care clinics in the United States found that streamlined counselling procedures (typically providing seven minutes of pretest counselling) facilitated a greater uptake of HIV testing than provision of more in-depth counselling, but that they made no difference to self-reported sexual risk behaviours four weeks after the test (33).

While certainly not definitive, these two studies suggest that in a setting in the United States, greater investment in counselling could achieve a larger effect than no counselling (32, 33). Evidence on the required level of intensity of counselling is not conclusive, however, and it may vary between settings.
Self-testing

What does the evidence say about the effect of self-testing on sexual behaviour?

- Self-testing may increase uptake of HTS and increase knowledge of HIV status.
- There is no indication of harm attributable to self-testing.
- Potential increases in risk-taking behaviours appear to be minimal.
- More research is needed on the effect of self-testing on sexual behaviour.

Self-testing technologies allow people to take a sample of blood or oral fluid, use a test kit and interpret the result themselves. Limited data are available on the impact that self-test use has on sexual behaviour, but some initial data indicate that the method could be preferred by some populations (34). It is possible that self-testing will be used by potential sexual partners or within established couples to see if the partners have the same HIV status.

In a 2017 meta-analysis, it was found from three randomized controlled trials that self-testing doubled uptake of HIV testing among men (RR = 2.12; 95% CI: 1.51–2.98) (35–37). Consideration of two randomized controlled trials among men who have sex with men showed that the frequency of testing nearly doubled (rate ratio = 1.88; 95% CI: 1.17–3.01), resulting in two more tests over a period of 12 to 15 months (mean difference = 2.13; 95% CI: 1.59–2.66) (38, 39). The same meta-analysis of two randomized controlled trials showed HIV self-testing also doubled the likelihood of an HIV-positive diagnosis (rate ratio = 2.02; 95% CI: 0.76–5.32). Across all randomized controlled trials, there was no indication of harm attributable to HIV self-testing, and potential increases in risk-taking behaviour appeared to be minimal.

A project in New York offered self-testing kits to men who regularly have sex with casual male partners without condoms (40). Concordant negative results were associated with some occasions of sex without condoms, but participants said that using the tests made them more aware of HIV risks. Sexual encounters ended whenever a potential partner received an HIV-positive results, thus potentially reducing exposure to HIV.

A potential limitation associated with the use of self-tests to assess HIV risks is that in the absence of counselling, users who have just received a negative test result may not always know about the window period and the possibility of recent acute HIV infections. Some users who do not receive counselling or support through other channels might therefore not consider the possibility of acute infection in their interpretation of results.

Due to high viral load during the acute infection stage, the risk of transmission is relatively high.

In Malawi, interviews with couples who had used self-tests demonstrated that the use of the test was often motivated by questions about the couple’s relationship and sexual behaviour (including suspicions of infidelity). Self-testing sometimes provided one partner with an opportunity to disclose a previously known but concealed HIV status (41).

One randomized controlled trial in Hong Kong evaluated the effect of promoting home-based HIV self-testing with online counselling on increasing HIV testing uptake among 430 gay men.
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and other men who have sex with men. Among men in the intervention group who received home-based HIV self-testing with online counselling in the last six months, the prevalence of condomless anal intercourse (Month 6 vs. baseline: $P < 0.01$) and multiple male sexual partnerships (Month 6 vs. baseline: $P < 0.05$) declined significantly compared to the control group (which received standard testing) (37). More research on the effects of self-testing on sexual behaviour and the uptake of HIV services is required.
Cohort studies: sexual behaviour change after an HIV-positive diagnosis

What does the cohort study evidence say about observed changes in sexual behaviour after an HIV-positive diagnosis?

- It is associated with an increase in condom use, especially among women.
- It can decrease high-risk sexual behaviour.

Cohorts can provide useful context about the process of behaviour change after knowledge of HIV infection. These studies can describe the natural history of subsequent behaviours, but it would be incorrect to assume that the behaviour changes they describe were caused by the knowledge of HIV-positive serostatus. While the temporal correlation could lead to this conclusion, it is possible that other secular and temporal trends also affect the behaviour, meaning that causal relations cannot be established.

A number of cohort studies provide insight into patterns of behaviour after people have been diagnosed with HIV. These studies generally suggest that many individuals who learn that they are living with HIV make some modifications to their behaviour, even over several years, although it is unclear whether these changes are a result of learning their serostatus.

Trends toward reduced high-risk sexual behaviours

A meta-analysis identified eight studies that examined the behaviour of individuals in the United States, with most data collected in the 1980s and 1990s (42). The pooled analysis found that the frequency of unprotected anal sex was more than 53% lower in persons aware of their HIV-positive status than it was among those who were unaware. Once it was adjusted to rule out sex with other people living with HIV, the average reduction in serodiscordant (or possibly serodiscordant) unprotected intercourse was 68%.

Evidence of increased condom use in cohort studies

In Uganda and Zimbabwe, a cohort assessing risks for HIV infection included 151 women who seroconverted while in the cohort (43). Twelve to 16 months after diagnosis, the proportion reporting consistent condom use increased from 26% to 44% (OR = 1.99; 95% CI: 1.12–3.53). Women who seroconverted reported fewer sexual acts after diagnosis, although women who did not acquire HIV did not report similar changes.

A South African trial of an HIV prevention intervention provides data on 327 women before and after their diagnosis with HIV (44). Significant decreases in several measures of sexual risk behaviour after seroconversion were reported, and these differences were maintained for the average of 18 months that the women remained in the study. While these differences were statistically significant in a multivariate model, the changes in absolute figures were modest. The authors noted that the overall levels of risk behaviour remained high in this cohort, highlighting a need for more effective HIV prevention interventions.

A follow-up of around five years for a cohort of female sex workers in Kenya (265 of whom acquired HIV while in the study) allowed for observations on the durability of behaviour changes (45). Incidence of unsafe sex declined by 44% postdiagnosis; this decrease was
maintained over time. After adjustment, the researchers found a long-lasting decline in unsafe sex of 31% postdiagnosis, independent of age. The proportion of women who maintained consistent condom use increased from 59% pre-diagnosis to 67% postdiagnosis.
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**Operational considerations**

**Balancing numbers tested and intensity of counselling**

Some discussion or counselling is necessary in the context of HIV testing to ensure informed consent. However, counselling sessions also may actively be used to promote behaviour change in those tested. There are a number of different models of risk reduction counselling, but they frequently involve an individualized risk assessment, target behaviours the client is willing to disclose and change, and work with the client to develop an achievable risk reduction plan.

Most counselling is based on the premise that change is a dynamic process in which small steps may ultimately lead to the desired outcome. It is usually recognized that the progression through stages is influenced by factors that must be specific for each stage, and that they need to be tailored to each client’s capabilities and circumstances (46). This process can be time-consuming and may pose operational challenges in busy clinics. At the same time, as discussed previously, there is no clear evidence that confirms that intensive counselling is more effective than streamlined counselling over the periods studied. Operational considerations of staff time therefore may influence testing approaches applied in a specific setting.

Programme managers may be motivated by a desire to maximize the potential behavioural impact of HIV testing, leading them to emphasize the provision of risk reduction counselling. However, extra counselling increases costs, and the evidence on its additional benefit is mixed at best. Furthermore, as many health-care providers see risk reduction counselling as difficult to provide, they may feel limited in expanding HTS due to constraints in providing counselling, thereby creating a barrier to increasing the number of people who test by a significant amount. Too much emphasis on counselling therefore may distract from the current primary purpose of HIV testing, which is to diagnose individuals living with HIV and link them to care, treatment and prevention services. At the same time, testing services remain an important entry point for reaching people engaging in higher risk practices, and opportunities for increasing risk perception for these populations through counselling and referral to other HIV prevention services need to be utilized.

**Improving positivity rates in HIV testing: diagnosing serodiscordant couples and people who are HIV-positive**

The more modest behavioural impact that testing has on people receiving an HIV-negative result reinforces the need for HIV testing programmes that focus on individuals who are at elevated risk of infection. Doing so would promote behaviour change in people who learn that they are living with HIV and allow them access to antiretroviral therapy.

In contexts where few people living with HIV know their status, testing modalities such as PITC can reach large numbers of people, particularly women, who are more likely to access other health services (such as contraception or maternal health services). In settings where the majority of people living with HIV already know their status, testing modalities need to focus on reaching groups that have not yet tested (such as adult men, who do not commonly seek health services).

Depending on local epidemiology, individuals at elevated risk of acquiring HIV may belong to specific key populations. In order to engage them effectively, it may be necessary to provide outreach or mobile testing services, locate services in suitable locations or involve community
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members in planning and delivery so that services are appropriate and accessible. The inclusion of this local knowledge in the provision HTC to those most at risk of acquiring HIV is a key component of the UNAIDS approach to Fast-Track combination prevention.

The promising data on couples testing programmes and the behavioural impact for people who learn that they are in a serodiscordant relationship suggest that HTC may have its greatest behavioural impact with couples. Programmes could capitalize on this by giving greater emphasis to interventions that help couples learn and discuss their status together. Although a substantial proportion of new infections occur within primary relationships in many settings, implementation of couples testing has generally been limited to heterosexual couples in African settings. Emerging data indicate that the approach is acceptable to gay men and other men who have sex with men in some settings, but the potential for couples-based testing has not been sufficiently explored for other populations. Furthermore, the partners of people diagnosed with HIV are a priority group for testing and behavioural support: programmes need to create mechanisms to promote repeat testing and help partners maintain risk reduction strategies.

It is vital that post-test counselling for people with HIV addresses their health needs in a holistic manner that challenges stigma, rather than being focused on concerns about onward transmission.

**The 5 Cs: consent, confidentiality, counselling, correct test results and connection to care**

Regardless of the model of service delivery, WHO has outlined the “five Cs” that all HTS must follow in all circumstances: consent, confidentiality, counselling, correct test results and connection to care (4).

- People taking an HIV test must give informed consent to be tested and counselled; they should be informed of the process involved and their right to decline testing. Services must be attentive to situations of coerced testing, especially among vulnerable populations or within couples.

- Services must be confidential, meaning that discussions between the person testing and the service provider are not disclosed to anyone else without the expressed consent of the client. Local laws, regulations and policies must protect the rights of individuals in relation to consent and confidentiality.

- HTS should be accompanied by appropriate, high-quality pretest information and post-test counselling. Quality assurance mechanisms and supportive supervision and mentoring systems should be in place to ensure the high quality of counselling. WHO and UNAIDS guidelines recommend that post-test counselling be provided regardless of test result, and that it should include an explanation of the test result, advice on risk reduction and the provision of condoms and referrals. For those testing HIV-positive, counselling also should include emotional support, discussion of the patient’s safe disclosure of his or her HIV status, and referral of the patient’s partners and children for testing.

- Quality assurance mechanisms should be in place to ensure the provision of correct test results. For example, services need a reliable supply of quality-assured test kits and a testing algorithm that outlines the confirmatory testing required before an individual is given an HIV-positive diagnosis. One of the key ways that HIV testing may encourage behaviour change is by giving people
The effectiveness of behavioural interventions to prevent HIV. A compendium of evidence.

information about their HIV status and that of their partners; that information must be accurate if it is not to be harmful.

- Testing services must provide adequate and robust connections to prevention, care and treatment services. Individuals who are informed that they may have HIV but who then disengage from care and lose contact with services may be having difficulty adjusting to their diagnosis in the absence of support. Moreover, while the treatment cascade is well-described for people who are diagnosed with HIV, many people who receive HIV-negative results might benefit from referrals to prevention services (such as VMMC or PrEP), reminders to repeat their test and ongoing monitoring.

These principles should also apply to self-testing technologies. The relationship between self-testing and behaviour change remains unclear at this early stage, and it likely will vary according to setting, population, delivery mechanism (e.g., through established health services or commercial outlets) and messages in social marketing. If studies do show that the use of self-tests help people make better-informed sexual decisions that are free from harms such as coercion, violence or misinterpretation of results, then the delivery and social marketing of self-tests could be focused on groups that are at the greatest risk of infection.
The effectiveness of behavioural interventions to prevent HIV. A compendium of evidence.

**Population considerations**

Due to the limited evidence available, the previously cited systematic reviews by Fonner et al., Kennedy et al. and Marks et al. were only able to compare outcomes by gender or serostatus (5, 18, 42). They were unable to compare outcomes among different key populations or to draw any conclusions about the impact of HTC in different groups. In almost all cases, the modality studied was VCT with pretest and post-test counselling. Table 2 summarizes data from studies in specific populations.

**Table 2**

Evidence of the impact of HIV counselling and testing on sexual behaviour change, by population

<table>
<thead>
<tr>
<th>Population group</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>People receiving positive results</td>
<td>Evidence from multiple settings of behavioural changes (condom use and fewer sexual partners) during the first year after diagnosis (5, 13, 42).</td>
</tr>
<tr>
<td>People in serodiscordant relationships</td>
<td>Behavioural changes following positive diagnosis, more so for people in serodiscordant relationships (13, 14).</td>
</tr>
<tr>
<td>People receiving negative results</td>
<td>No impact on behaviour or new infections in most studies (5, 13).</td>
</tr>
<tr>
<td>Women</td>
<td>Mixed evidence, but some data suggest more behaviour change in women than men (17, 52).</td>
</tr>
<tr>
<td>Men who have sex with men</td>
<td>Sexual behavioural changes following positive diagnosis, including selecting other partners living with HIV (serosorting) (42).</td>
</tr>
<tr>
<td>Other key populations</td>
<td>Data are limited and more research is needed.</td>
</tr>
</tbody>
</table>

**Gender differences**

Two reviews did analyse outcomes by gender and found no statistically significant differences (5, 42). Nonetheless, there are some suggestions that testing can sometimes have a greater impact on women than men. Fonner et al. did observe a nonsignificant trend for women to have a greater reduction in partner numbers than men (5). Two randomized trials of community-based HTC showed positive results on some key indicators, especially among women (16, 17). Some cohort studies among women in African countries suggest sustained behaviour change after HIV diagnosis through VCT (43–45).

Apart from these observations, the available evidence offers little insight into the effect of HTC, specifically on young women and adolescent girls.

**Couples testing**

The literature also suggests that VCT interventions for couples may have more impact than individual testing when it comes to effecting behaviour change for heterosexual couples, especially those learning that their relationship is serodiscordant (13–15, 22).

**Gay men and other men who have sex with men**

The only data concerning gay men and other men who have sex with men come from western countries and China. A few studies raise questions about the benefits of the
established model of risk reduction counselling for gay men and other men who have sex with
men, suggesting that alternative counselling approaches (29, 30) or information alone could
possibly be more effective (28). A randomized study conducted in China that compared an
enhanced counselling intervention (including use of video) with a standard counselling
intervention observed a reduction in condomless anal intercourse six months after testing,
regardless of HIV status, but there was no impact on HIV incidence (47).

**People who inject drugs**

For people who inject drugs, one study in the United States found that risk reduction
counselling had no impact on sexual risk behaviour, but that it did lead to reduced
multiperson use of injecting equipment (31). While more reliable studies are lacking, cross-
sectional data suggest that some people who inject drugs may practise serosorting, avoiding
multiperson use of injecting equipment with people who have a different HIV or hepatitis C
status (48, 49). Testing could therefore have a behavioural impact on this population.

**Sex workers**

The three systematic reviews did not identify any studies specifically conducted with sex
workers, although one of the cohort studies that suggested long-term behaviour change after
diagnosis was conducted with female sex workers (45).
Conclusion: HIV testing services

HTC is an indispensable element of a combination HIV prevention approach. It plays a central role as the gateway into HIV services, both for those living with HIV and those who are HIV-negative, and it increasingly provides access to more enhanced biomedical prevention (including PrEP). As the review of the evidence has shown, HTC contributes to behaviour changes—particularly among people who test HIV-positive—that may decrease the risk of HIV transmission, but it is not sufficient on its own. It is therefore a necessary but not sufficient component of an HIV prevention response.
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