Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings (Review)

Ojo O, Verbeek JH, Rasanen K, Heikkinen J, Isotalo LK, Mngoma N, Ruotsalainen E

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[Intervention Review]

Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Olumuyiwa Ojo[1], Jos H Verbeek[2], Kimmo Rasanen[1], Jarmo Heikkinen[1], Leena K Isotalo[3], Nomusa Mngoma[4], Eija Ruotsalainen[5]

[1]Institute of Public Health and Clinical Nutrition, Occupational Health Unit, University of Eastern Finland, Kuopio, Finland. [2]Occupational Safety and Health Review Group, Finnish Institute of Occupational Health, Kuopio, Finland. [3]Cochrane Occupational Safety and Health Review Group, Finnish Institute of Occupational Health, Helsinki, Finland. [4]School of Kinesiology and Health Studies, Queen's University, Kingston, Canada. [5]Kuopio University Hospital, Kuopio, Finland

Contact address: Jos H Verbeek, Occupational Safety and Health Review Group, Finnish Institute of Occupational Health, PO Box 310, Kuopio, 70101, Finland. jos.verbeek@ttl.fi.

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ABSTRACT

Background

The workplace provides an important avenue to prevent HIV.

Objectives

To evaluate the effect of behavioral interventions for reducing HIV on high risk sexual behavior when delivered in an occupational setting.

Search methods

We searched the Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE and PsycINFO up until March 2011 and CINAHL, LILACS, DARE, OSH Update, and EPPI database up until October 2010.

Selection criteria

Randomised control trials (RCTs) in occupational settings or among workers at high risk for HIV that measured HIV, sexual transmitted diseases (STD), Voluntary Counseling and Testing (VCT), or risky sexual behaviour.

Data collection and analysis

Two reviewers independently selected studies for inclusion, extracted data and assessed risk of bias. We pooled studies that were similar.

Main results

We found 8 RCTs with 11,164 participants but one study did not provide enough data. Studies compared VCT to no VCT and education to no intervention and to alternative education.

VCT uptake increased to 51% when provided at the workplace compared to a voucher for VCT (RR=14.0 (95% CI 11.8 to16.7)). After VCT, self-reported STD decreased (RR = 0.10 (95% CI 0.01 to 0.73)) but HIV incidence (RR=1.4 (95% CI 0.7 to 2.7)) and unprotected sex (RR=0.71 (0.48 to 1.06)) did not decrease significantly. .

Education reduced STDs (RR = 0.68 (95%CI 0.48 to 0.96)), unprotected sex (Standardised Mean Difference (SMD)= -0.17 (95% CI -0.29 to -0.05), sex with a commercial sex worker (RR = 0.88 (95% CI 0.81 to 0.96) but not multiple sexual partners (Mean Difference (MD) = -0.22 (95% CI -0.52 to 0.08) nor use of alcohol before sex (MD = -0.01 (95% CI of -0.11 to 0.08).

Authors' conclusions

Workplace interventions to prevent HIV are feasible. There is moderate quality evidence that VCT offered at the work site increases the uptake of testing. Even though this did no lower HIV-incidence, there was a decrease in self-reported sexual transmitted diseases and a decrease in risky sexual behaviour. There is low quality evidence that educational interventions decrease sexually transmitted diseases, unprotected sex and sex with commercial sex workers but not sex with multiple partners and the use of alcohol before sex.

More and better randomised trials are needed directed at high risk groups such as truck drivers or workers in areas with a very high HIV prevalence such as Southern Africa. Risky sexual behaviour should be measured in a standardised way.

PLAIN LANGUAGE SUMMARY

Workplace interventions can reduce risky sexual behaviours among workers.

We included eight studies with 11,164 participants but one study did not provide enough data to be useful. One study from Africa found a strong increase in uptake of Voluntary Counseling and Testing (VCT) to 51% when delivered on-site which was 14 times more compared to a voucher for off-site testing. However, VCT did not change HIV incidence in one study among African factory workers. In another study among HongKong truck drivers, VCTdecreased self-reported sexually transmitted diseases (STD) but VCT did not decrease unprotected sex significantly. Education was studied among soldiers in Nigeria, Angola and the US, truck drivers in India and factory workers in Thailand.. Education that was modelled after a motivational theory reduced STDs with 32%, decreased unprotected sex with a small amount, reduced sex with a commercial sex worker with 12% but did not decrease the number of partners or the habit of using alcohol before sex.

We concluded that workplace interventions for preventing HIV are feasible and that it is possible to study them in a randomised controlled trial. Peer influence has a positive effect on VCT uptake and workplace interventions can change risky sexual behaviour to a moderate degree. More randomised trials are needed in high risk groups or in areas with high HIV prevalence to find more effective interventions.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON *[Explanation]*

On site voluntary testing and counselling compared to Voucher for off-site VCT for uptake of HIV testing

Patient or population: patients with uptake of HIV testing
Settings: Occupational
Intervention: On site voluntary testing and counselling
Comparison: Voucher for off-site VCT

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Voucher for off-site VCT	On site voluntary testing and counselling				
Uptake of testing	**35 per 1000**	**495 per 1000** (416 to 590)	**RR 14** (11.75 to 16.68)	7482 (1 study)	⊕⊕⊕◯ **moderate**[1]	

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: Confidence interval; **RR:** Risk ratio;

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1] Outcomes reported were entirely different from those in the registered protocol in Corbett 2006

BACKGROUND

Description of the condition

Human Immunodefiency Virus (HIV) is a chronic infectious disease with a very high mortality, if untreated HIV infection constitutes a heavy burden on the health of the people. Infection with the Human Immunodeficiency Virus results eventually in AIDS in untreated infected patients. The virus is transmitted from one person to another through contact of mucous membranes or directly in the blood stream of an HIV infected body fluid such as semen, vaginal fluid, breast milk, blood or pre-seminal fluid. Exposure to these body fluids occurs through sexual intercourse, blood transfusion, contaminated needles or other sharp objects or through transmission from an infected mother to her child during pregnancy, delivery or breastfeeding.

Even though there is considerable achievement in the fight against HIV/AIDS, in terms of reduction in number of new infections and deaths from AIDS-related illnesses, the impact of HIV in the community and the work environment is great. The number of people living with HIV continues to grow and in 2008 an estimated 33.4 million people worldwide are living with HIV, which is 20% more than it was in 2000 and roughly a threefold increase over the prevalence in 1990 (UNAIDS 2009). The impact of the disease on the workforce is very serious for the affected countries. For example in Zambia in 1998, deaths of teachers equalled two-thirds of the number of graduates from teacher training colleges. In Thailand, a third of rural families affected by HIV/AIDS reported a 50% drop in their agricultural output (ILO 2002). According to ILO, between 1992 and 2004, the economy of 31 sub-Saharan countries heavily affected by HIV/AIDS shrunk by about 0.7% per year which was associated with a decreased labor supply due to HIV/AIDS (ILO 2006). Workers in occupational settings other than health workers and commercial sex-workers are equally exposed to the risk of contracting the disease like other groups in the community. However, some occupations may be at a higher risk than others, especially jobs with high mobility e.g. those in the military, truck drivers and those working in the transport sector or in the fishing and tourism industries (Pandley 2008). Various studies have classified long distance truck drivers and their assistants, bar/hotel workers as critical sources of HIV risk and transmission (Nzyuko 1991 Plummer 1991 Bwayo 1994 Stratford 2000). Migrant workers who leave their spouses to work abroad are also vulnerable to contract the virus and transmit it to their sexual partners when they return home (UNAIDS 2001a Saggurti 2009). Their vulnerability is compounded by poverty and low level of HIV awareness and its prevention (Islam 2010).

Description of the intervention

Despite the improvement in treatment and survival of HIV infection, there is still no cure for the disease and pharmacological approaches to prevention such as used in post-exposure prophylaxis or prevention of mother to child transmission are still in its infancy or not feasible to be used on a large scale (Mayer 2010). Prevention of HIV transmission, thus, still relies on behavioral risk prevention interventions, which employs educational and modification of behavior approaches (Darbes 2009). Behavioral interventions for reducing HIV infection aim to produce changes in behaviour that increases the risk of contracting HIV. This is achieved by directly targeting the high risk sexual behaviour such as sex without the use of condoms or through the promotion of uptake of specific prevention or health-seeking behavior such as Voluntary Counseling and Testing for HIV (VCT) (Manhart 2005). This can be done at individual or at the group/community level (ILO 2002).The workplace creates the possibility to easily reach persons who have similar high risk behaviours because of the nature of their work. The occupational setting and occupational health services, thus, offer a good environment to provide HIV preventive services and interventions (Charalambous 2004).

How the intervention might work

There is growing evidence that the reduction in HIV incidence in some countries can be linked to behavioral changes which are the result of behavioral intervention programs (UNAIDS 2001b; Darbes 2009).There are many theories and models about how behavioral change occurs. The most common models and theories on which behavioural interventions are built include the Information-Motivation-Behavioural skills (IMB) model (Fisher 2009), the Social Cognitive Theory (Bandura 2001) and Theory of Reasoned action (Ajzen 2007). Even though the details of the theories are different, they have similar ideas. They aim to change factors believed to be predictors of behavior, such as health beliefs (the risk of contracting HIV is negligible), cognitions (HIV is not an important risk for me), attitudes (nothing wrong with multiple partners), social norms (no sex before marriage) or skills (negotiation for safe sex). This involves conveying information to the target groups through education, training and counselling which could be done at individual or at group level. In the same vein, behavioral interventions for preventing HIV aim at changing these factors in order to reduce risky sexual behavior. In addition, based on economic theory, incentives such as monetary or non-monetary stimuli can be used to influence behaviour such as free condoms. In the context of this review, we are concerned only with risky sexual behaviour such as unprotected sex with a partner whose status is unknown, multiple sexual partnerships, drinking alcohol before having sex and sex with commercial sex workers (ILO 2002).

Why it is important to do this review

This review will focus on behavioral interventions to reduce risky sexual behaviour of workers to reduce the heterosexual transmission of HIV infection. There have been systematic reviews about the effectiveness of behavioral interventions to prevent HIV among health workers, sex workers and other population subgroups (Parantainen 2008 Kondagunta 2009 Johnson 2008 Naranbhai 2011). However, there has been no review of studies done for workers in general, who have an important role in the economy and well being of the society. Thus, this study sought to fill this gap in knowledge.

Also, despite the substantial funding and resources put into the workplace HIV prevention programmes, there is little evidence to show the impact of these interventions, this further justifies the reason for this review.

OBJECTIVES

To evaluate the effect of behavioral interventions for reducing HIV on high risk sexual behavior of workers when delivered in an occupational setting.

METHODS

Criteria for considering studies for this review

Types of studies

We included all randomised controlled trials regardless whether they were randomised at the individual or at the group level such as cluster randomised trials. We also intended to include cross-over trials but we found none. Even though it is more difficult to perform randomised trials in the occupational setting, we did not include non-randomised studies because behavioural interventions usually can be randomised at the individual level or the group level.

Types of participants

Workers who are either employees because they are hired to perform tasks for an employer or workers who do not have a regular employment contract but who are at higher risk of contracting HIV through their occupation. The following occupations are reported to be at higher risk: people working in transport, fishing and seafaring, tourism industries, migrant workers and military personnel (Pandley 2008). Because it is possible that workers are at risk of HIV through other risky behaviours such as intravenous drug use or through men having sex with men, we assumed that this would not play a major role in workers if this would not be explicitly reported.

We excluded health care workers at risk through sharp object injuries and sex workers because interventions aiming at these groups have been reviewed already (Parantainen 2008, Kondagunta 2009).

Types of interventions

We included studies on behavioral interventions which are defined as interventions that are (1) tailored to reduce high risk sexual behaviours such as unprotected sex and multiple partners, sex with commercial sex workers, and (2) to improve uptake of voluntary counselling and testing (VCT). We included Voluntary testing and counselling because it is known to change behaviour (Corbett 2006)

Behavioral interventions can be categorized into individual-level or group-level interventions based on the following characteristics.

Individual-level Interventions operate mainly on personal modifying factors such as knowledge, attitudes, intentions, skills and self esteem. This includes voluntary counselling and testing, counselling without HIV testing, individual cognitive behavioral therapy, couple counselling, telephone help-lines or interactive Internet based interventions.

Group level interventions not only utilize the personal modifying factors but also use the advantage of the characteristics of the cohort/group to influence peer perception, attitude and behavior about safe sex and condom use. Group level interventions focus on the community or group of people, with interventions delivered to small groups in the work place.

We also categorized interventions according to the stage of the epidemic when the study was done: early stage interventions done before the year 2000 and later stage interventions done after the year 2000. This is because the impact of employer interventions may vary according to the stage of the epidemic, and the level of knowledge in the general population.

Behavioural interventions are usually complex and contain various components. Thus, we extensively described the components of the interventions to be able to see if there are any components that could imply higher effectiveness. Such components of behavioural intervention include: skills training on correct condom use, negotiation for safer sex, condom distribution or promotion, counselling with or without HIV testing, couple counselling, small group discussion on promotion of safe sex, role play, cognitive behavioral therapy, workplace-based sex education, telephone helplines, interactive Internet based interventions e.g. chat rooms. We also described the number of sessions, their length and intensity. This is shown in Table 1

In addition, we intended to categorize interventions as economic incentives if they made use of monetary or non-monetary means to induce non-risky sexual behaviour but we did not find these interventions.

Types of outcome measures

Studies which measured the effect of the intervention on the following were included:

1. *Indicators of high risk sexual behavior.* We used the following imitative number of categories of risky sexual behaviour:unprotected sex defined as the proportion of sex acts without male or female condoms, multiple partners defined as more than one sexual relationship at the same time, sex with commercial sex workers, unprotected sex with commercial sex workers and alcohol use before sex. The outcomes can be self-reported or based on an objective measure such as the number of condoms used.

Authors of the included studies asked many different questions about risky sexual behaviour and they used a widely varying terminology to describe similar outcomes and also measured the same outcomes with multiple questions. To avoid reporting similar outcomes more than once we mapped the outcomes reported in the included studies to one or more of the risky sexual behaviour categories mentioned above. We did so without knowledge of the effect of the intervention on the outcomes. For each study we used only one outcome from each category and we used the outcome that in our view best fitted the category. The various outcomes based on questions asked from the study participants and the corresponding categories in this review are described in Table 2. We put the best fitting questions on top in the table.

2. *Voluntary Counseling and Testing*: The combination of counselling and testing for HIV aims at changing risky sexual behaviour. We took the uptake of voluntary counselling and testing (VCT) as an indicator of positive health behaviour indicating a positive change.

2. *Incidence of HIV and Sexually Transmitted Infections (STI).*

Search methods for identification of studies

Different sources of published and unpublished research literature were searched to locate studies relevant to behavioral interventions for reducing HIV risk or infection in occupational settings. For constructing a relevant search strategy we sought for search terms for the following concepts. For HIV, we adopted the search strategy of the HIV-Review Group. For workers we adopted the search strategy developed by the OSH Review Group. For RCTs we used the most sensitive and precision maximizing search strategy as advocated by the CC (2008 revision,Lefebvre 2011) . To exclude health care workers at risk we used 'sharps OR needle stick'. To exclude sex workers we used 'sex workers'.

We searched all the databases listed below and adapted the PubMed strategy in the protocol to the other databases. The date of the last search was 19 November 2010. In March 2011, we realised that some authors did not use the words "occupation" or "work" which are the two main items to locate studies in occupational settings but that some of them only used the specific words for that occupation such as truck driver or marine. Therefore, we did an additional search for the following occupations with a known increased risk of contracting HIV: soldiers, seafarers, fishermen, long-distance truck drivers and bartenders in PubMed, CENTRAL, Embase, and PsycINFO and also updated the former searches in these main databases. The date of the last search was thus 18th March 2011. Details of the search strategies can be found in the Appendices (Appendix 1; Appendix 2; Appendix 3; Appendix 4; Appendix 5; Appendix 6; Appendix 7; Appendix 8; Appendix 9).

Electronic searches

Studies were located using electronic databases. The reviewers worked with the Trials Search Coordinator of the Occupational Safety and Health Review Group-Ms Leena Isotalo, to search for the studies. The following electronic databases and web sites were searched:

- The Cochrane Central Register of Controlled Trials (CENTRAL) 2011, Issue 1, part of *The Cochrane Library*. www.thecochranelibrary.com (accessed 10 March 2011)
- Medline (PubMed, 1966 to March 2011, accessed 9 March 2011)
- Embase (embase.com, 1974 to March 2011, accessed 11 March 2011)
- Cinahl (EBSCO, 1989 to October 2010, accessed 4 October 2010)
- The OSH Review Groups specialized register (COSH database, accessed 10 March 2011). Accessible online at http://osh.cochrane.org/databases
- PsycINFO (OvisSP, 1967 to March 2011, accessed 18 March 2011)
- OSH-update databases (accessed 22 September 2010)
- LILACS (accessed 3 November 2010)
- EPPI-Center (Evidence for Policy Practice Information and Coordinating Center at the Social Science Research Unit, Institute of Education, University of London) databases: DoPHER(Database of Promoting Health Effectiveness Reviews), TRoPHI(Trials Register of Promoting Health Interventions), Bibliomap, Evidence Library. Accessible online at http://eppi.ioe.ac.uk/cms/ (accessed 9 November 2010)
- DARE (Database of Abstracts of Reviews of Effects, York Center for Reviews and Dissemination), part of *The Cochrane Library*. www.thecochranelibrary.com (accessed 28 September 2010). Accessible online at http://www.york.ac.uk/inst/crd

Hand searching

We also searched known databases relevant to unpublished work such as the System for Information on Grey Literature in Europe (SIGLE) for grey literature. We searched the references of retrieved articles for additional references.

The search of literature was not limited by the language in which it was published, so all articles/studies available on the databases as listed in the protocol were retrieved including articles written in Portuguese and Spanish from LILACS database. Interpretation was sought for articles written in languages other than English.

Data collection and analysis

Selection of studies

After employing the search strategies outlined above, the identified references were divided between the authors so that two people examined each reference.

Based on the title and abstract, each author independently assessed whether a reference in his or her share met the inclusion criteria or not. Next, we read all articles from this first selection full-text to see if any met our inclusion criteria. We did this with two authors independently and in case of disagreement asked a third author to make a new assessment.

Data extraction and management

Two review authors independently extracted data from each of the included trials, regarding the country where the study was conducted, characteristics of the study participants (as per study inclusion criteria) and setting of the study such as the occupation, type of work and branch of industry and types of interventions and outcomes. Results data (means and standard deviations for continuous outcomes and count data for dichotomous outcomes) were also extracted for the purpose of meta-analysis. Disagreements were resolved by consensus. For the intervention we extracted descriptive data as outlined above

Assessment of risk of bias in included studies

Two review authors independently assessed the quality of studies, in terms of risk of bias of the included studies. A consensus method of mutual agreement was used to resolve disagreements.

We evaluated the validity of the trials according to the Cochrane Collaboration Handbook (Higgins 2008) as implemented in the RevMan software program to assess the risk of bias of the selected RCTs and cluster RCTs. Review authors independently assessed the risk of bias within each included study based on the following six domains with ratings of 'Yes' (low risk of bias); 'No' (high risk of bias) and 'Unclear' (uncertain risk of bias):

Sequence generation

Description: the method used to generate the allocation sequence was assessed to know whether it produced comparable groups; review authors' judgment: was the allocation concealment sequence adequately generated?

Allocation concealment

Description: the method used to conceal allocation sequence was evaluated to assess whether intervention schedules could have been foreseen in advance of, or during recruitment; review authors' judgment: was allocation adequately concealed?

Blinding of outcome assessors, care providers and participants

Description: measures used to blind outcome assessors were evaluated to assess if outcome assessors, intervention providers and other participants had knowledge as to which intervention a given participant might have received; review authors' judgment: was knowledge of the allocated intervention adequately prevented during the study? However, blinding of participants and intervention providers are impossible in behavioral interventions.

Incomplete outcome data

Description: if RCT studies did not report intention-to-treat analyses, attempts were made to obtain missing data by contacting the study authors. Data on attrition and exclusions were extracted and reported as well the numbers involved (compared with total randomised), reasons for attrition/exclusion where reported or obtained from investigators, and any re-inclusions in analyses performed by review authors; review authors' judgment: were incomplete data dealt with adequately by the reviewers? (See also 'Dealing with missing data', below).

Selective outcome reporting

Description: We assessed selective outcome reporting in the studies by comparing the objectives of the study and outcomes in the methods section to outcomes reported in the result section; review authors' judgment: are reports of the study free of suggestion of selective outcome reporting?

Other sources of bias

Studies were assessed for any other possible source of bias; review authors' judgment: Was the study apparently free of other problems that could put it at a high risk of bias?

Measures of treatment effect

Results of each trial were calculated as point estimates, risk ratios (RR) for dichotomous outcomes with the 95% CI, and means and standard deviations (SD) for continuous outcomes. Standardized mean differences (SMDs) were used for pooling outcome data from different instruments deemed similar enough for comparison.

We arranged all outcomes in such a way that a higher score indicated a more risky sexual behaviour and if necessary we recalculated the outcomes to achieve this. Lau 2010 reported the consistent use of condoms for those who had sex with a non-regular partner and sex with commercial sex workers. We assumed that the rest of the group that reported to have sex with a non-regular partner or a commercial sex worker belonged to our category unprotected sex. We used these figures in the data-analysis for this study. Cornmann 2007 reported a mean of five point scale for frequency of condom use with a non-marital partner ranging from

never (1) to always (5). We reversed the score for the intervention and the control group to get a measure for the amount of unprotected sex.

Risky sexual behaviour per category could be reported both as a continuous or a dichotomous outcome e.g. the number of unprotected sex acts or having had unprotected sex yes or no. We reported these separately and refrained from recalculating the dichotomous outcomes into effect sizes because we felt that this would make the results too difficult to interpret.

For studies that reported outcome data at more than one follow up time, we choose the last follow up time. Most of the studies had only two follow measurements apart from baseline, so the second follow up was used.

Unit of analysis issues

We checked if studies that employed a cluster-randomised design and reported sufficient data to be included in the meta-analysis made an allowance for the design effect. We included four cluster randomised controlled trials (Bing 2008; Boyer 2004; Corbett 2006; Kuchaisit 1996). Bing 2008 used a hierarchical mixed linear model with random subject effects and we thus assumed that they adjusted for the cluster effect. Corbett 2006 and Boyer 2004 used robust standard errors that took the clustering into account. Kuchaisit 1996 did not account for the clustering but the confidence intervals were already wide and therefore we decided not to further widen them.

Dealing with missing data

We tried to contact Bassett 1998 to obtain data missing in their reports which were needed for meta-analysis but without success. For Bassette study we did not get any tangible data from the abstract that was presented at a conference in which the only conclusion was that there was a significant difference and no other numbers. Due to the lack of data, the results of this study have not further been taken into account in this review. We also contacted Kuchaisit 1996 and we received the master thesis on which the reports were based and we extracted data from the thesis. We used the data at three month follow-up as the outcome data. For Cornmann 2007, we did not have the standard deviation (SD) from the result data and therefore we calculated the SD from the P-value and the ANCOVA F-value according to the methods described in the Cochrane Handbook (Higgins 2008) in chapter 7.7.3.3.

Assessment of heterogeneity

First, we assessed clinical homogeneity based on the similarity of the intervention, control condition, outcome, population and follow-up time. 'Similarity' of interventions was determined by review authors by assessing whether the interventions in question (e.g. educational programmes and counselling) could reasonably be supposed to yield similar effects across different populations.

We decided that VCT was different from other educational programmes.

Even though the control conditions for the VCT interventions were not the same we deemed the result of these control conditions sufficiently similar to be combined. In one study the control group received a voucher for VCT but hardly any of these used the voucher and thus this was similar to no VCT. In another study VCT was compared to brief information which lasted a couple of minutes only but without VCT. Therefore we considered only one comparison of VCT versus no VCT for the risky sexual behaviour outcomes. For the uptake of testing we could only use one study that compared two different ways of offering VCT and for this outcome this was a different comparison.

We considered all educational interventions that used a similar theory of IMB as similar. All studies used a control group which they provided with alternative information and therefore these studies were all combined in one comparison.

We also tested for statistical heterogeneity by means of the chi square test as implemented in the forest plots in RevMan 5. We set the significance level at $P < 0.10$ to indicate if there is a problem with heterogeneity. In addition, we quantified the degree of heterogeneity using the I^2 measure where an I^2 value > 50% indicates a moderate degree of heterogeneity and a value of > 75% a high degree of heterogeneity.

Assessment of reporting biases

In order to reduce the effects of reporting bias we included studies and not articles. For articles reporting on the same study, we extracted relevant data from the articles but reported them as being from the same study. This is the case in Corbett 2006, we extracted uptake of VCT from Corbett 2006 and HIV incidence from Corbett 2007, and they have a single study identity as Corbett 2006. To prevent location bias we searched multiple databases. Language bias was prevented by not excluding any article based on language restrictions. We checked for outcome reporting bias as part of the quality assessment.

Data synthesis

We pooled data from studies judged to be clinically homogeneous with RevMan 5 software.

Where risky sexual behaviour was measured in the same category, we combined studies using mean differences. Where measurements of the same concept were different such as for unprotected sex, we used standardised mean differences (SMDs). To make the SMDs more readily interpretable we recalculated the pooled SMD into an MD by multiplying the SMD by the median SD taken from included studies using the question of number of unprotected sex acts with occasional partners. When I^2 was more than 50% we used a random-effects model in the meta-analysis.

We used the GRADE approach as described in the Cochrane Handbook (Higgins 2008) to present the quality of evidence. We

listed all the comparisons and outcomes in an additional table and added our judgement of the five quality dimensions (limitations, heterogeneity, indirectness, imprecision, publication bias) for each particular comparison and outcome (Table 3). We did so to make our rating of the quality of evidence (high, moderate, low, very low) more transparent.

Subgroup analysis and investigation of heterogeneity

We compared studies conducted with participants drawn from different occupational settings or branches of industry (e.g. truck drivers), different stages of the HIV epidemic and from big or small firms, the cut-off point for being a small firm was set at 50 employees.

Sensitivity analysis

We conducted sensitivity analyses to test the robustness of our meta-analysis results by leaving out studies judged to have a high risk of bias.

RESULTS

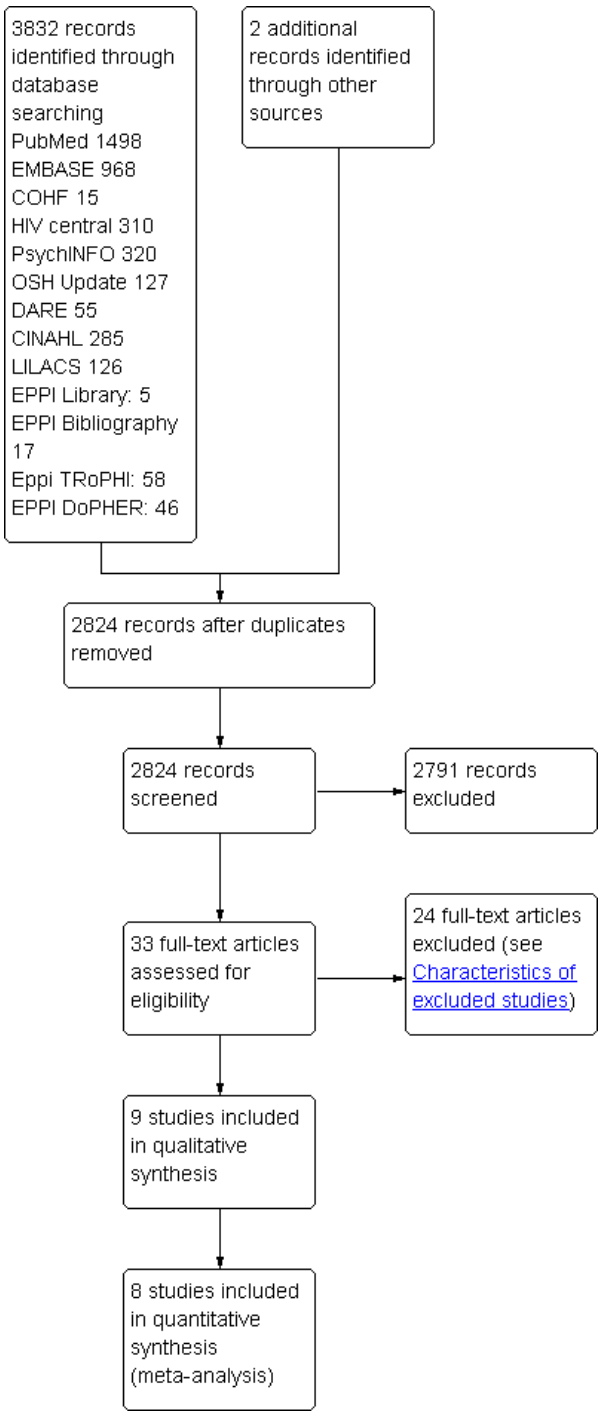
Description of studies

See: Characteristics of included studies; Characteristics of excluded studies; Characteristics of ongoing studies.

Results of the search

Total search results was 3874 references, this was reduced to 2824 after deleting duplicates. The abstract of the 2824 references were read and based on the inclusion criteria and information available in the abstract, 33 relevant articles were identified to be read full text, from which nine articles fulfilled our inclusion criteria. Corbett 2006 and Corbett 2007 reported on the same study, so we finally included eight studies. Details of references from each database are shown in Figure 1.

Figure 1. PRISMA diagram showing flow of studies in this review.



We found 2 ongoing trial that might be included in our study, Boyer 2010 Amirkhanian 2008

Included studies

See Characteristics of included studies.

Study design

Three of the studies were individual-based RCTs (Cornmann 2007; Essien 2010; Lau 2010) and four were cluster RCTs (Bing 2008; Boyer 2004; Corbett 2006; Kuchaisit 1996).

Geographical location

Six out of the eight included studies were from developing countries with four studies from Africa (Bassett 1998; Corbett 2006; Bing 2008; Essien 2010) and three studies from Asia with the Cornmann 2007 study from India, one study from Thailand (Kuchaisit 1996) and one study from Hongkong, China (Lau 2010). One study was from the United States (Boyer 2001).

Year of study / stage of epidemic

Two of the included studies were done in the early stage of the epidemic of HIV, in 1996 and 1998 (Kuchaisit 1996; Bassett 1998), while the other studies were done in the later stage of the epidemic, when there was some decline in the global incidence of HIV (UNAIDS 2009). The year 2000 was chosen as the demarcation between early stage and late stage of the HIV epidemic in this review.

Types of participants

There was a variety of workers in the included studies, Bassett 1998, Kuchaisit 1996 and Corbett 2006 majority of participants were factory workers. Corbett 2006 reported that 14 out of 22 included businesses were in the construction industry or production of industrial goods, three each in the production of clothes and food and two in telecommunication. Cornmann 2007 and Lau 2010 had truck drivers as participants. Three studies (Bing 2008; Boyer 2004; Essien 2010) were done in the military. All the studies had participants older than 18 years. Two of the studies (Boyer 2004; Essien 2010) included only women. We had a total of 11,164 participants included in seven studies, excluding participants of Bassett 1998, which number was not given, however, there were 36 factories involved in the study.

Types of outcomes

Detailed descriptions of outcome measures from each study and how they were used in this review are shown in Table 2.

Two studies used HIV incidence as the primary outcome (Bassett 1998; Corbett 2006) but the data from one study were not available and could not be retrieved. One study used the results of tests for STIs (Boyer 2004) and one study self-reported STIs (Lau 2010). One study used the uptake of VCT as the outcome (Corbett 2006). Unprotected sex and multiple sexual partners were main outcomes in six studies (Bing 2008; Boyer 2004; Cornmann 2007; Essien 2010; Kuchaisit 1996; Lau 2010). Sex with a commercial sex worker was an outcome in two studies (Lau 2010; Cornmann 2007) and unprotected sex with a commercial sex worker was the outcome in two studies (Bing 2008; Lau 2010)

Types of interventions and control interventions

See Table 1 for description of content of interventions of each study. VCT was the intervention in the studies of Bassett 1998, Corbett 2006 and Lau 2010. Bassett 1998 combined this with peer education and compared it to VCT only. Corbett 2006 used a control group that was offered a voucher for off-site VCT at a commercial counselling service. Lau 2010 again did not offer VCT to the control group but only very brief HIV-prevention information.

Four of the included studies, Boyer 2004, Cornmann 2007, Bing 2008 and Essien 2010, had the same theoretical background because they employed educational sessions based on the Information-Motivation-Behaviour skills model as the intervention. They differed however in their mode of delivery (e.g. Essien 2010 used Video based delivery), in content of intervention, different follow up time and the control group. The program for the control group included alternative health education for Boyer 2004 and Bing 2008, while Essien 2010 and Cornmann 2007 had information/education only without motivation and the behavioral skills training component of IMB.

Kuchaisit 1996 used an educational model for HIV prevention and compared this to a no education control group.

Excluded studies

See Characteristics of excluded studies.

We excluded a total of 28 studies from among the relevant studies for which their full text were read. The main reason for exclusion was that most of the studies were non-randomised studies. Some of the excluded studies had participants as health workers, some of them not workers and a study included drug users.

Risk of bias in included studies

See Figure 2,Figure 3

In general most of the studies had a high risk of bias, with only 2 studies (Corbett 2006;Lau 2010) judged as having a low risk of bias. Details of identified bias in each study are given below.

Figure 2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.

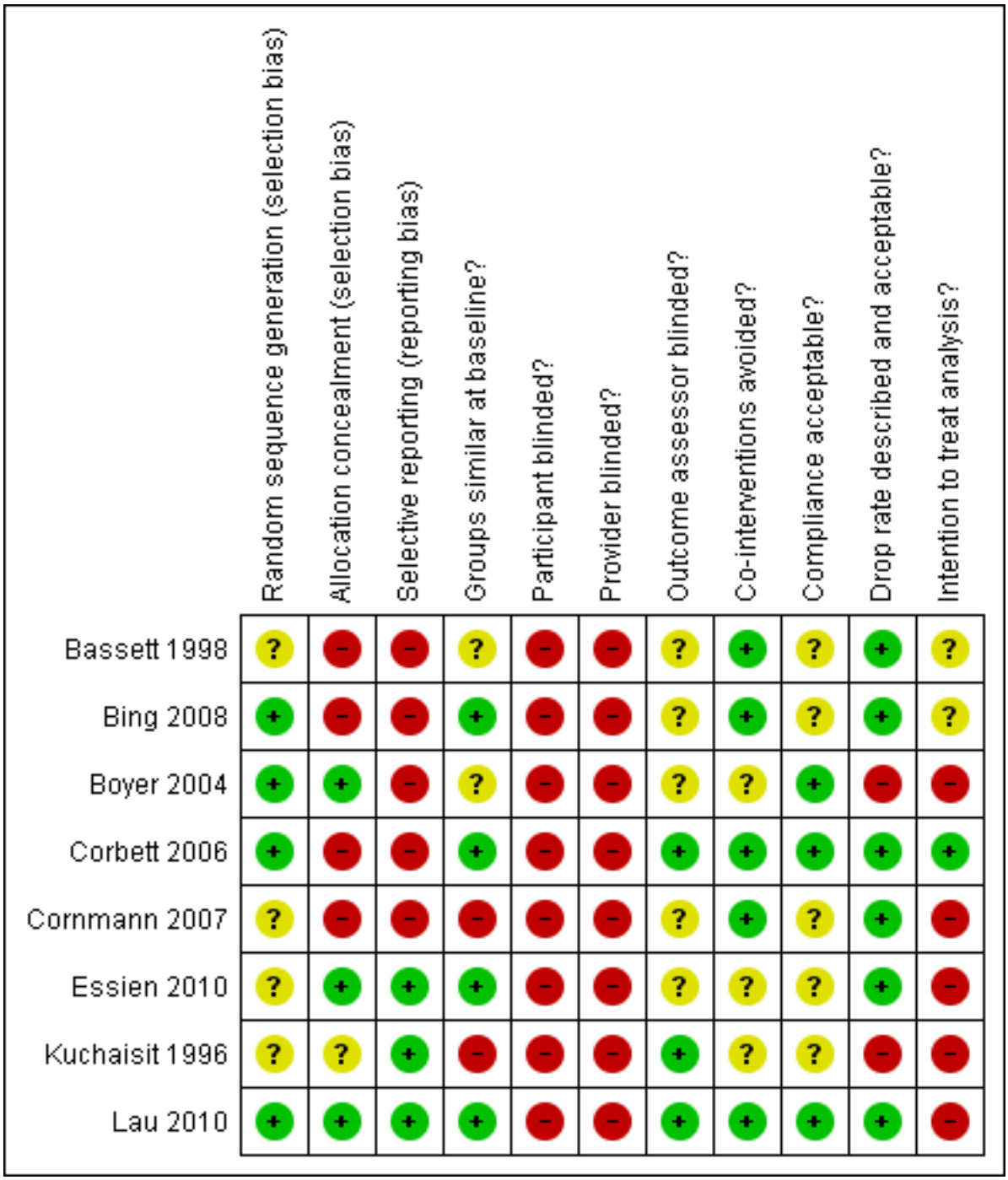
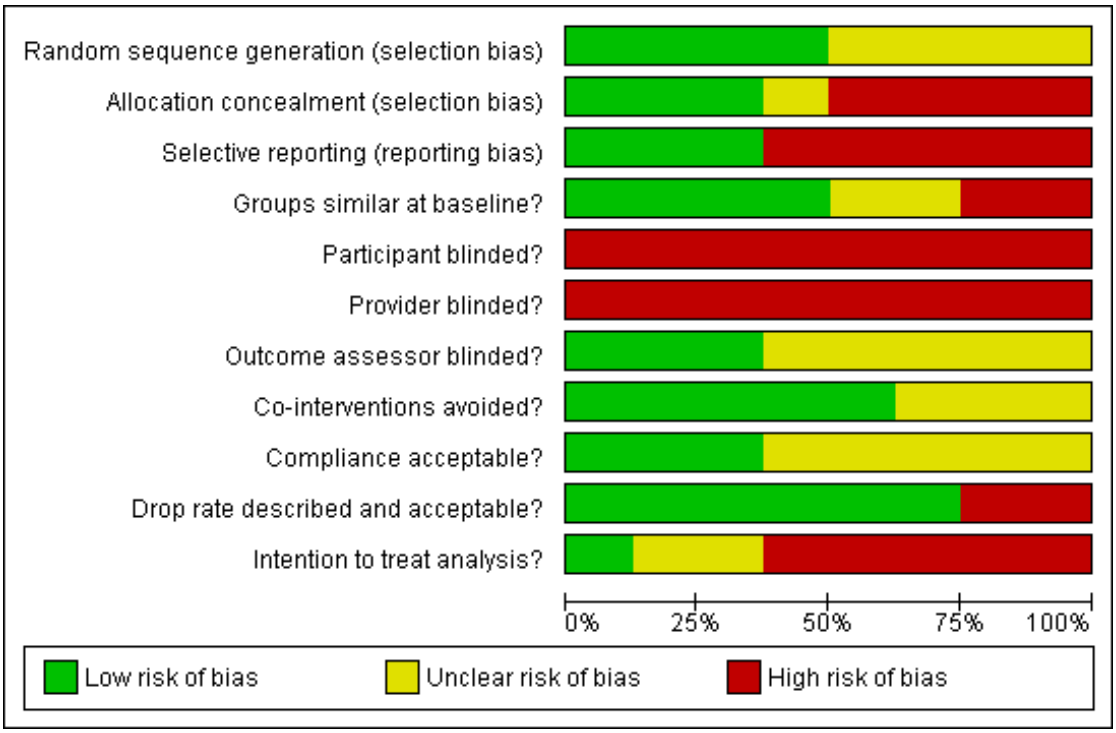


Figure 3. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.



Allocation

Sequences generation was reported and judged adequate in four studies (Bing 2008; Boyer 2004; Essien 2010; Lau 2010) with also proper allocation concealment except for (Bing 2008).

Blinding

It is not possible to blind the subjects and the care provider in behavioral intervention studies, this is the case in all the studies reviewed. However, blinding of outcome assessors was done in two studies, (Corbett 2006 Lau 2010).

Incomplete outcome data

In Bassett 1998, the primary outcome was not reported. Attrition rate was poor in Boyer 2004, as only 65% completed the trial. Except for Corbett 2006, none of the studies reported to have undertaken an Intention-to-treat analysis.

Selective reporting

Only three studies were free of selective reporting (Essien 2010; Lau 2010; Kuchaisit 1996). Corbett 2006 listed absenteeism and tuberculosis incidence as primary outcomes, but their values were not reported; also seen in Boyer 2004 in which only subgroups of each outcome were fully reported, with little information on the outcome itself.

Other potential sources of bias

In four of the studies, intervention and control groups were judged as sufficiently similar at baseline, in three this was not clearly enough reported to be judged and in two studies there was a discrepancy between intervention and control group at baseline (Kuchaisit 1996; Cornmann 2007).

Effects of interventions

See: **Summary of findings for the main comparison** On site voluntary testing and counselling compared to Voucher for off-site VCT for uptake of HIV testing; **Summary of findings 2** Theory based education compared to alternative education for reducing risky sexual behaviour

1. On site Voluntary Counselling and Testing Vs a voucher only.

This comparison was based on only one study (Corbett 2006)

1.1 Outcome: Test uptake

Uptake of VCT was increased when delivered at On-site facilities compared to providing a voucher for free off-site testing with a RR=14.0 (95% CI 11.8 to 16.68) Analysis 1.1.

2. Voluntary Counselling and Testing Vs no VCT

The comparison is based on Corbett 2006 for HIV incidence and on Lau 2010 for risky sexual behaviour.

2.1 HIV incidence

There was a non-significant increase in HIV incidence in the intervention group that got VCT delivered on-site compared to no VCT, with RR=1.4 (95% CI 0.71 to 2.7) Analysis 2.1

2.2 Outcome: Self-reported Sexually transmitted infection

The risk of self-reported STIs was significantly reduced by 90% in the VCT group, RR=0.10 (95% CI 0.01, 0.73) Analysis 2.2

2.3 Outcome: Unprotected sex

Unprotected sex with a non-regular partner was reduced, but not statistically significantly, in the VCT intervention group compared to the control group that got no VCT but only brief information with control, RR=0.71 (95% CI 0.48 to 1.06) Analysis 2.3

2.4. Outcome: Unprotected sex with commercial sex worker

There was a significant reduction in unprotected sex with commercial sex worker among the intervention group, RR= 0.46 (95% CI 0.24 to 0.89).Analysis 2.4

2.5. Sex with Commercial sex worker.

The intervention did not significantly decrease the number of participants who engaged in sex with commercial sex workers among those who had VCT compared to the control group, RR= 0.99 (95% CI 0.78 to 1.25).Analysis 2.5

2.6. Outcome: Alcohol use before sex

The number of participants who took alcohol frequently before having sex with a commercial sex worker was significantly reduced among the intervention group with a RR of 0.44 (95% CI 0.20 to 0.98).Analysis 2.6

3. Education vs No education

Only one study could be included in this comparison (Kuchaisit 1996). When judging the results it should be taken into account that the authors did not adjust for the clustering effect.

3.1 Outcome: unprotected sex

Education resulted in a significant decrease in unprotected sex, RR=0.19 (95% CI 0.04, 0.83).Analysis 3.1

3.2 Outcome: Multiple sex partners

Education caused a non-significant decrease in sex with extra partner, RR=0.47 (95% CI 0.21, 1.04) Analysis 3.2

4. Education and training (IMB) Vs Alternative education

Four studies (Boyer 2004;Cornmann 2007; Bing 2008; Essien 2010) were included in this comparison but not all measured the same outcome.

4.1. Outcome: Incidence of Sexually Transmitted Infection

There was a 32% decrease in incidence of STI among those in the intervention group compared to the control group, RR=0.68 (95% CI 0.48 to 0.96) (Boyer 2004)(Analysis 4.1)

4.2 / 4.3 Outcome: Unprotected sex

We did a meta-analysis of unprotected sex outcome data from the 3 studies, there was a significant reduction in unprotected sex in the intervention group with a Standardised Mean Difference of -0.17(95% CI -0.29 to -0.05) but a non significant outcome in the fourth study that could not be combined in the meta-analysis (Analysis 4.2; Analysis 4.3). Using the standard deviation of 1 from Bing 2008, the SMD translates back to a mean difference of 0.17 in the number of unprotected sex acts, which is a small decrease only.

4.4 Outcome: Unprotected sex with commercial sex partner

Unprotected sex with commercial sex worker in the past 3 months was not significantly reduced in the intervention group, mean difference= -0.16(95% CI -0.37 to 0.05)(Bing 2008) (Analysis 4.4)

4.5 / 4.6 Outcome: Multiple sex partners

Having sex with someone other than wife or husband was reduced in the intervention group in three studies, but this reduction was not statistically significant with a mean difference=-0.22 (95% CI -0.52 to 0.08). Due to the high number of sex partners in one study there was a high statistical heterogeneity with I^2 of 80%. In a study that could not be combined in the meta-analysis, there was a slight non-significant increase in persons having multiple sex partners . (Analysis 4.5; Analysis 4.6)

4.7. Outcome: Sex with commercial sex worker

Sex with commercial sex worker was reduced at follow up for the intervention group with RR=0.88 (0.81, 0.96) (Cornmann 2007) (Analysis 4.7)

4.8. Outcome: Alcohol use before sex

Data pooled from 2 studies (Bing 2008; Essien 2010) showed a non-significant difference in the number of participants who drank alcohol before sex with commercial sex workers. Mean difference=-0.01 (95% CI of -0.11 to 0.08) (Analysis 4.8). The meta-analysis of alcohol use before sex is illustrated in forest plot, Figure 6.

GRADE

The quality of evidence for comparisons that were based on one study only was downgraded with one level because of imprecision and in case of a study with a high risk of bias with another level to low quality evidence. For other comparisons and outcomes that included more studies, we downgraded the evidence with two levels because of a high risk of bias in the included studies (Table 3)

Sensitivity analysis

There were two studies (Corbett 2006 and Lau 2010) with a low risk of bias that could be included in the sensitivity analysis. The two studies employed VCT as the intervention, this means that the results of the VCT intervention still hold when only studies with low risk of bias are included. It also means that for other interventions, no strong conclusions are possible.

Heterogeneity/ Subgroup analysis

The PICO elements of the included studies varied. The most prominent variation is that in baseline rates of risky sexual behaviour when it is measured. The average number of multiple partners varied with a factor 100 and unprotected sex with a factor 20. Even though this did not prevent us from combining studies, it is conceivable that this would influence the efficacy of the interventions. When risky behaviour is very frequent it will be easier to decrease it than when this is not the case. The study by Cornmann 2007 seems to confirm this with much higher effect sizes though the intervention was shorter than the studies among military. However, the number of studies was too small to perform a formal subgroup analysis.

Occupations included in this review varied also from more or less self-employed truck drivers to a very hierarchical military structure. Also here it is conceivable that the effects of interventions will be different. Due to the small number of studies this could not be tested in a subgroup analysis.

We planned to do a subgroup analysis comparing studies based on year of epidemiology. We have 2 studies (Kuchaisit 1996 Bassett 1998) done at the early stage of the HIV epidemic. We have data from the latter but it uses education without theoretical background, so it was difficult to compare with other studies that used education and training skills with theoretical background (based on IMB model).

ADDITIONAL SUMMARY OF FINDINGS *[Explanation]*

Theory based education compared to alternative education for reducing risky sexual behaviour

Patient or population: patients with reducing risky sexual behaviour
Settings:
Intervention: Theory based education
Comparison: alternative education

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Alternative education	Theory based education				
Number of sex partners varying questions. Scale from: 0 to 20. Follow-up: mean 6 months	The mean number of sex partners in the control groups was **3.6 partners**	The mean number of sex partners in the intervention groups was **0.22 lower** (0.52 lower to 0.08 higher)[1]		1048 (3 studies[2])		

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: Confidence interval;

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1] Based on meta-analysis of Bing 2008, Cornmann 2007, Essien 2010

[2] Another study (Boyer 2004) that reported a dichotomous outcome was not included in the meta-analysis the outcome was RR 1.04 (95CI 0.95-1.15)

DISCUSSION

Summary of main results

There was moderate quality evidence that on site VCT leads to a higher test uptake through the effect of peer interaction. Even though VCT did not lead to a lower but possibly even to a higher HIV incidence in one RCT, there was moderate quality evidence in another trial that VCT lead to a decrease in the incidence of self-reported sexually transmitted diseases and risky sexual behaviour such as unprotected sex and alcohol use before sex but there was no decrease in sex with commercial sex workers.

There was low quality evidence that educational interventions, when based on the IMB model, reduced sexually transmitted diseases, unprotected sex and sex with commercial sex workers but there was no significant decrease in sex with multiple sexual partners nor in use of alcohol before sex . An educational intervention in one other trial not based on the IMB model did not result in changes, but the attrition was so large that we did not trust the result.

Overall completeness and applicability of evidence

We included eight RCTs, but one was not usable due to lack of data. Thus our review has shown that workplace behavioral interventions can be evaluated in RCTs. We had difficulty in locating all studies because we used general search terms for work and occupation while many authors used only the specific occupation such as truck drivers or military. Because of the additional searches for a number of important occupations at risk for HIV, we feel confident that we covered all the available studies. The trials that we found were pragmatic and conducted under real life conditions. Therefore, we conclude that behavioural interventions are feasible in work places. In one trial it was demonstrated that there was an effect of peers upon the uptake of testing and other trials all used small group discussions to increase the effectiveness of the intervention. Risky sexual behaviour was also similar for similar occupational groups and therefore easier to target. These trials show that the workplace as the arena for intervention certainly offers benefits over a more general population approach.

There were four studies from Africa and three from Asia and one from the United States. More studies were conducted in Africa but none of these other studies were randomised and thus not included in this review (see Characteristics of excluded studies). There were no studies from South Africa even though this is a fairly industrialized African country with a very high HIV prevalence among workers and this would thus offer a good opportunity for workplace interventions. There is literature that these are conducted but apparently these are not evaluated in randomised trials. (William 2003

Participants were both men and women and important occupations at higher risk of contracting HIV were covered such as truck drivers in two studies and military in three studies. Risky sexual behaviour varied greatly in these studies with 95% of truck drivers in India mentioning having sex with commercial sex workers against 50% of the truck drivers in HongKong. The mean number of sexual partners in the past three months was again largest in Indian truck drivers with 18, smallest in male Angolan soldiers with 0.2 and in between with 1.5 in female Nigerian soldiers.

The educational interventions varied from a single session (Cornmann 2007) to five full day sessions (Essien 2010). Most educational interventions had multiple components and covered the various aspects considered important in influencing risky sexual behaviour such as negotiation skills or skills in using condoms. The interventions were also focused on the target groups and were sometimes preceded by extensive focus group studies to make the information as relevant as possible.

All important outcomes that we envisaged in our protocol were measured even though not in all studies at the same time. There were three studies that measured incidence of HIV or STI. The study that measured HIV incidence postulated that VCT could increase risky sexual behaviour but that study did not measure risky sexual behaviour. There was however no evidence in another study that used VCT as the intervention that there would have been an increase in risky sexual behaviour after VCT. In all but one study, risky sexual behavior was measured and we could map all risky sexual behaviours to one or more of the four categories that we considered the most important behavioural outcomes.

Quality of the evidence

We found only 2 studies (Corbett 2006 and Lau 2010) with low risk of bias, while the remaining 6 studies had a high risk of bias. Judged overall, the quality of the evidence was low (Table 3). Problematic was that most studies used multiple questions to measure risky sexual behaviour without a priori concretely defining their primary outcome. We tried to avoid reporting bias by defining risky sexual behaviour in four categories and mapping the questions from the trials to these four categories. There was certainly selective reporting as Corbett 2006 intended to use absenteeism and TB as their primary outcome measures according to their registered protocol whereas they reported only VCT-uptake and HIV incidence. The authors did not reply to our various requests for more information. Also in other studies it was not always clear which outcomes were measured and reported. Standardisation of measurement of risky sexual behaviour is necessary to be better able to interpret the results of studies.

We used the GRADE approach to assess the quality of evidence for the pooled data, in view of risk of bias, heterogeneity, indirecteness, precision and publication bias (using funnel plots). See .

Potential biases in the review process

We believe that we prevented language bias by not excluding any study based on language. Reporting bias was avoided by including studies and not articles.

We tried to avoid reporting multiple outcomes for the same study by mapping the outcomes to five categories of risky sexual behaviour. The category that we considered most important was unprotected sex with non-regular partners. This was however ill-defined in the included studies. In our view, this should be measured by the proportion of unprotected sex acts of all sex acts. It was however measured as the number of unprotected sex acts or the frequency of condom use which we all deemed similar as indicators of unprotected sex.

We combined studies with only male and only female participants and we also disregarded differences in occupations, because we believe that the intervention would work similarly in these groups and because there was no appreciable statistical heterogeneity in the meta-analysis. Because there were few studies only, we could not perform a subgroup analysis to elaborate potential differences in effect in these subgroups.

Agreements and disagreements with other studies or reviews

Uptake of VCT was higher at the workplace which compares favourably to the results of another Cochrane Review that studied home-based versus other VCT models. This review found that uptake at a local hospital was higher contrary to expectations (Bateganya 2010). The uptake in the included study was 51.1% which is much higher than the 20% to 23% uptake reported in other workplace VCT programmes elsewhere in Africa (Van der Borght 2010). In this study, the author report that special campaigns or events immediately increase the uptake of VCT and this might explain the difference in uptake between the two studies. Another Cochrane review showed that media campaigns lead to an immediate increase in the uptake of testing (Vidanapathirana 2005).

One of the included studies reports a non-significant higher incidence of HIV among the intervention group having intensive on-site VCT. The authors speculate that this could be due to the fact that people are more likely to engage in high risk sexual behavior after a negative test result. This was not supported by another VCT study in our review that on the contrary showed a reduction for several behavioural indicators. Another study not included in this review showed that HIV seropositive individuals tend to show up earlier for workplace VCT than HIV negative colleagues (Van der Borght 2010). This finding does also not indicate that VCT leads to more risky sexual behaviour. Therefore we believe that our findings support the approach to VCT advocated by the ILO as one of the prevention methods to enable workers to know their HIV status (ILO 2010).

Behavioural interventions have been shown to change risky sexual behaviour in other target groups. A Cochrane review showed a reduction of 27% of unprotected anal sex in men who have sex with men after behavioural interventions (Johnson 2008). Peer education, not employed at the workplace but similar to the programmes used in the studies in our review, showed similar results as in our review. Morisky 2005 showed an increase in condom use following peer education and Jackson 1997 showed a decrease in extra marital sex but there was no change in unprotected sex/condom use despite the educational programs.

AUTHORS' CONCLUSIONS

Implications for practice

Workplace interventions to prevent HIV are feasible. There is moderate quality evidence that VCT offered at the work site increases the uptake of testing. Even though this has not been shown to lead to a lower HIV-incidence, there was a decrease in self-reported sexual transmitted diseases and a decrease in unprotected sex after VCT but not a decrease in sex with commercial sex workers.

There is very low quality evidence that educational interventions decrease sexually transmitted diseases, unprotected sex and sex with commercial sex workers but not sex with multiple partners and the use of alcohol before sex.

Implications for research

Randomised control trials to prevent HIV at the work place are feasible both applied as a cluster-randomised design and as an individually randomised design. The available evidence is of low quality and there are few studies only and therefore more and better trials are needed preferably randomised at the individual level. Future trials should be directed at high risk groups such as truck drivers or workers in areas with a very high HIV prevalence such as Southern Africa. Interventions should be based on the IMB model and be tuned to the target population of which this review includes several good examples. Control groups should be offered non-HIV but equivalent education to be able to measure the impact of the intervention content. As outcomes, future studies should measure both change in sexual risk behaviours and HIV seroconversion or sexual transmitted disease infection over a longer follow up period. Risky sexual behaviour should be measured in a standardised way and be related to unprotected sex, sex with multiple partners, sex with commercial sex workers and alcohol use before sex.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Bassett 1998

Methods	Cluster Randomised Trial, factories randomised
Participants	Factories in manufacturing industry. Inside the factories only men, 18 years and above, and able to give consent for the study etc Intervention group: 20 factories are randomised to this group, details of the number of participants in each industry or in the group as a whole was not given Control group: 16 factories were randomised to be in the control group
Interventions	Intervention: Peer-led education consisting of educational sessions, voluntary counselling and testing, peer support/information, condom distribution, small group discussion and role play. Duration: unclear frequency at least once during the study led by peer educator Control: No peer education, but have counselling, testing and adequate condom supply at a 6 monthly visit
Outcomes	Incidence of HIV infection. The incidence was compared in 2 ways: Intervention Vs Control, and overall incidence in each factory
Notes	As described in the article, it seems the health education was not a well organised session, so we conclude that the intensity of the intervention might be low

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not reported.
Allocation concealment (selection bias)	High risk	Not possible.
Selective reporting (reporting bias)	High risk	The primary outcome was not reported.
Groups similar at baseline?	Unclear risk	Not reported.
Participant blinded?	High risk	Not possible
Provider blinded?	High risk	Not possible.
Outcome assessor blinded?	Unclear risk	Not reported.
Co-interventions avoided?	Low risk	VCT present in both groups.
Compliance acceptable?	Unclear risk	Not reported.

Bassett 1998 (*Continued*)

Drop rate described and acceptable?	Low risk	4 factories dropped out of the study, because of time that would be involved
Intention to treat analysis?	Unclear risk	Not reported.

Bing 2008

Methods	Cluster randomised controlled trial
Participants	568 military men who were randomly selected by their commanders. They were randomly assigned into intervention(280 men) and control(288 men)
Interventions	Intervention consists of educational sessions involving information, motivation and Behavioural skills (IMB) in 5 sessions over a period of 5 days with each session lasting 4 hours each, it was delivered by a local civilian facilitator. The content of the intervention includes information on HIV symptoms, transmission, prevention and treatment; skills training on correct condom use, and promotion, HIV risk reduction skills, condom distribution, negotiation for safe sex, small group discussion and role play
Outcomes	Condom use: Unprotected sex with commercial sex worker, unprotected sex with occasional partner in past 3 months. High risk sexual behaviour: number of occasional and commercial sex partners in past 3 months, and alcohol before sex
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Using a coin toss
Allocation concealment (selection bias)	High risk	Not done
Selective reporting (reporting bias)	High risk	Not all outcomes were reported, some were just mentioned as non-significant
Groups similar at baseline?	Low risk	age, sex, occupation, risk behaviour.
Participant blinded?	High risk	Impossible
Provider blinded?	High risk	Impossible
Outcome assessor blinded?	Unclear risk	Not reported
Co-interventions avoided?	Low risk	A national HIV campaign administered to the general population

Bing 2008 (*Continued*)

Compliance acceptable?	Unclear risk	Not reported
Drop rate described and acceptable?	Low risk	86.4% retention rate at 6 months
Intention to treat analysis?	Unclear risk	all analyses were intention to treat

Boyer 2004

Methods	Cluster randomised controlled trial
Participants	2157 female marine recruits were randomly assigned into either intervention group (1062 participants) or control group (1095 participants). However, 1916 completed the project, 939 in intervention and 977 in control group
Interventions	Educational sessions involving Cognitive behavior-building approach which focuses on the elements of Information-motivation-behavioral skills model. It involves educational strategies such as didactic teaching, interactive group discussions, self risk appraisals and educative videos. The components include skills training on correct condom use, condom promotion, skills training for negotiation of safe sex, cognitive behavioral elements and HIV risk reduction skills. There were 4 sessions, each lasting 2 hours and was led by 2 civilian facilitators Control: Educational sessions to promote healthier food choices, reduce training injuries, prevention of cervical and breast cancer in young women. This was done in 4 sessions, 2 hours each led by 2 civilian facilitators
Outcomes	Sexually transmitted infections (STIs), Number of multiple sexual partners, sex with casual sex partner, inconsistent condom use
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated random number table
Allocation concealment (selection bias)	Low risk	Informed of group assignment only at first intervention session
Selective reporting (reporting bias)	High risk	Only subgroups were fully reported
Groups similar at baseline?	Unclear risk	Age, sex, occupation and HIV status were similar at baseline
Participant blinded?	High risk	Impossible

Boyer 2004 (*Continued*)

Provider blinded?	High risk	Impossible
Outcome assessor blinded?	Unclear risk	Not reported
Co-interventions avoided?	Unclear risk	Not reported
Compliance acceptable?	Low risk	85% attended all sessions
Drop rate described and acceptable?	High risk	Drop out not acceptable, only 65% completed the trial.
Intention to treat analysis?	High risk	Missing data were not included in analysis.

Corbett 2006

Methods	Cluster Randomised control trial
Participants	7482 participants were recruited from 22 businesses that met the inclusion criteria, 11 in each group. 3950 participants from 11 businesses in the intervention group while the control group has 3532 participants from 11 businesses Inclusion criteria: employees expected to remain employed for at least 3 months, business must have 100-600 workers and there should be an occupational or first aid clinic
Interventions	Voluntary counselling and testing in 2 settings: onsite HIV testing (intervention group) , and off-site testing using vouchers distributed to the workers to visit the VCT clinic (control group) for individual sessions. The intervention lasted for 10 months and follow up over 2 years. Debriefing meetings and refresher training were held every 2 weeks and 6 months respectively
Outcomes	1. Uptake of VCT in both groups(those who really took the test). 2. uptake of VCT in the on-site VCT centre group Vs uptake of Voucher (for counselling visit) in the off-site VCT centre group. 3. HIV incidence in both groups.
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer program in STATA.
Allocation concealment (selection bias)	High risk	Not possible.

Corbett 2006 (*Continued*)

Selective reporting (reporting bias)	High risk	in protocol stated that absenteeism and TB incidence were primary outcomes, but were not reported
Groups similar at baseline?	Low risk	Based on the characteristics of each group given in table 1.
Participant blinded?	High risk	Not possible.
Provider blinded?	High risk	Not possible.
Outcome assessor blinded?	Low risk	anonymous HIV screening was done (this applies to one of the outcome measures (HIV incidence)
Co-interventions avoided?	Low risk	Condom distribution to all participants
Compliance acceptable?	Low risk	14% did not consent in HIV test at start
Drop rate described and acceptable?	Low risk	0% for VCT uptake and 32% for 2nd HIV test
Intention to treat analysis?	Low risk	analysed according to randomisation

Cornmann 2007

Methods	Randomised controlled trial
Participants	Long distance truck drivers. 250 male participants recruited from truck stops with 125 in either intervention or control group. Age range of 20-78years (mean=39 years). 98% were married, 95% were heterosexual and remaining 5% bisexual
Interventions	Intervention: Information-motivation-behavioral (IMB) skills intervention group. It involved a single workshop using the IMB theory. It comprises of 1 session of 4 hours for each participant in a group session of 11-16 truck workers. Workshop was co-facilitated by 2 Masters level social workers. Control group: information only without motivation and behavioral skills training
Outcomes	1. Sex with someone other than wife in past 4 months. 2. Sex with commercial sex worker in past 4 months. 3. Condom use, total number of times used in the past 4 months with marital partner. 4. Had used condom with wife in past 4 months. 5. Number of times condoms were used with non-marital partners in past 4 months
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**

Cornmann 2007 (*Continued*)

Random sequence generation (selection bias)	Unclear risk	Not reported.
Allocation concealment (selection bias)	High risk	Not possible.
Selective reporting (reporting bias)	High risk	Haphazardly reporting of results.
Groups similar at baseline?	High risk	The Pre-test done at baseline shows several significant differences between the 2 conditions. e.g. there are more sexual partners in the intervention group
Participant blinded?	High risk	Not possible.
Provider blinded?	High risk	Not possible.
Outcome assessor blinded?	Unclear risk	Not reported.
Co-interventions avoided?	Low risk	Condom distribution.
Compliance acceptable?	Unclear risk	Not reported.
Drop rate described and acceptable?	Low risk	78% were available for the 10 month sexual and condom use behaviour assessment
Intention to treat analysis?	High risk	Not reported.

Essien 2010

Methods	Randomised controlled trial
Participants	346 Military women, recruited from 2 cantonments in Nigeria using a convenience sampling approach. They were randomly assigned as 174 in intervention group and 172 in the control group. They were at least 18 years old, had history of multiple sexual partners, incidence of STI in the past year, a resident of study sites, and speak English
Interventions	Intervention: A video-tape based HIV prevention intervention based on the IMB model involving education and motivational skills training. It comprises 5 session of 90 minutes each consisting of videotape presentations, modelling, practice sessions and corrective feedback, and group sessions. It also involve HIV education, risk sensitization, risk avoidance and risk management, use of male and female condoms, modelling, discussions, avoidance of substance abuse, sexual assertiveness and negotiation for safe sex. The sessions were led by 2 female commissioned officers educated as facilitators. Control: also video tape based, but only didactic information and discussion approach without any motivational and skills-building component. It was led by 2 different facilitators not involved with the intervention group; it also had 5 sessions for 90 minutes each

Essien 2010 (*Continued*)

Outcomes	1. Condom use according to composite scale (0-21) with higher scores indicating more use. 2. Vaginal sex without condom in past 3 months. 3. Number of sex partners. 4. Alcohol use before sex.
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	"they were randomly assigned..."
Allocation concealment (selection bias)	Low risk	"using a concealment of allocation technique..."
Selective reporting (reporting bias)	Low risk	all outcomes reported
Groups similar at baseline?	Low risk	age, education, marital status, risk behaviour were similar at baseline
Participant blinded?	High risk	Not possible
Provider blinded?	High risk	Not possible
Outcome assessor blinded?	Unclear risk	Not reported
Co-interventions avoided?	Unclear risk	Not reported
Compliance acceptable?	Unclear risk	Not reported
Drop rate described and acceptable?	Low risk	Less than 20%
Intention to treat analysis?	High risk	Drop outs were exempted from analysis

Kuchaisit 1996

Methods	Cluster randomised controlled trial
Participants	301 factory workers selected from 16 factories in peri-urban settings in Thailand. They are 15 to 60 years of age, either single or married. The factories were randomly allocated to either education group (8 factories, 153 men) or control group (8 factories, 148 men) . At follow-up at three months there was a large drop-out because most participants did not return the diaries on which the outcome measurement was based. Post intervention: intervention 39 and control 66. Three months follow-up: intervention 33 and control 22

Kuchaisit 1996 (*Continued*)

Interventions	Intervention group: Education only, group sessions involving a 20 minutes presentation using slides, brochures, two way communication regarding AIDS, correct use of condoms, and posters exhibition. The program lasted over 2 weeks
Outcomes	1. Contact with extra-partner in the past week measured at three months follow-up 2. Unprotected sex with partner other than wife in the past week measured at three months follow-up
Notes	Data are based on the master thesis

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Cluster randomisation of 16 factories, but how it was done was not described
Allocation concealment (selection bias)	Unclear risk	Not reported.
Selective reporting (reporting bias)	Low risk	All outcomes reported
Groups similar at baseline?	High risk	Intervention group is seven years younger on average, 30% less married
Participant blinded?	High risk	Not possible.
Provider blinded?	High risk	Not possible.
Outcome assessor blinded?	Low risk	Outcome based on self-report diaries
Co-interventions avoided?	Unclear risk	Not reported.
Compliance acceptable?	Unclear risk	Not reported.
Drop rate described and acceptable?	High risk	Drop out post intervention 65% and at 3 months follow-up 82%
Intention to treat analysis?	High risk	No

Lau 2010

Methods	Randomised controlled trial
Participants	Cross border truck drivers, male, over 18 years, who have had sex with CSW in past year, and have a mobile phone number. 301 participants were randomised into intervention group (147) and control group (154)

Interventions	Voluntary counselling and testing (VCT) plus Information dissemination on HIV prevention using 3 information leaflets and letter from HIV+ patient. It was a onetime intervention done individually lasting 30-45 minutes provided by HIV field workers
Outcomes	1. Those that used condom consistently with CSW 2. Used condom with non-regular partner, and 3. Self-reported Sexually transmitted diseases (STDs)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	" participants were randomly allocated to...by opening a randomisation envelope"
Allocation concealment (selection bias)	Low risk	the fieldworker was concealed of the allocation sequence
Selective reporting (reporting bias)	Low risk	all outcomes were reported
Groups similar at baseline?	Low risk	Age, marital status, education level and place of residence.
Participant blinded?	High risk	Impossible
Provider blinded?	High risk	Impossible
Outcome assessor blinded?	Low risk	fieldworker was concealed of the allocation sequence and the study was made anonymous
Co-interventions avoided?	Low risk	A similar co-intervention was in place to the general public which involves police action against prostitution in china
Compliance acceptable?	Low risk	all participants in intervention group received VCT
Drop rate described and acceptable?	Low risk	96% completed follow up
Intention to treat analysis?	High risk	results reported according to other criteria than randomisation, even though they stated they used ITT analysis

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Boyer 2001	Not a randomised controlled study, it was a quasi experimental study
Celentano 2000	Not a randomised controlled study
Cherian 2009	No randomisation, it was a cross-sectional study.
Clift 2003	Not a randomised controlled study.
Ginwalla 2002	Not a randomised controlled study and no behavioural intervention
Hearst 1999	A non-randomised before-and-after intervention study.
Jackson 1997	Not a randomised controlled study. Though participants were workers in transport sector and has behavioral interventions and relevant outcome
Jenkins 2000	Intervention was conducted among patients attending a STD clinic and not at workplace specifically and it was not for healthy workers
Kravitz 1995	A randomised controlled trial among workers but it was not about behavioral intervention
Lindenberg 2002	The study was not among workers and no behavioral changes reported
Mbizvo 1997	Not a randomised controlled study, though it was done among workers using behavioral intervention
McCoy 2009	Drug users were included in the study.
Mitchell 2002	Not a randomised controlled study and not among workers.
Montgomery 1995	Participants were health workers-Nurses.
Morisky 2005	The study uses a quasi-experimental design, not a randomised controlled study. A behavioural intervention among workers in tourism industry
Mugoyelaand 2009	A cross-sectional descriptive study, behavioral intervention among workers
Nyblade 2001	Participants were not solely workers; it was a population-based VCT intervention study
Prier 1991	Not a randomised control study.
Pronyk 2008	Not a behavioral intervention, involves using Micro finance to generate social capital at the community level
Rhodes 2009	Not a randomised controlled study, and not among workers.
Sankondhavat 1998	Not a randomised controlled trial.

(*Continued*)

Shuguang 2003	Not a randomised controlled study
Tian 2007	It is a cluster randomised study but the participants were not workers
William 2003	Not a randomised controlled study, even though it was a behavioral intervention among workers

Characteristics of ongoing studies *[ordered by study ID]*

Amirkhanian 2008

Trial name or title	Fostering an AIDS Research and Training Center Infrastructure in Russia (Labor Migrant HIV Prevention Trial)
Methods	Randomised outcome trial
Participants	Labor migrant workers in Russia.
Interventions	Behavioral: Social Network Intervention
Outcomes	Primary outcome: Unprotected sexual intercourse events with a non-spousal partner. Secondary outcome: AIDS-related knowledge, attitudes, intentions, perceived norms, and self-efficacy. Substance use related to sexual behavior, use of alcohol or other drugs in relation to sexual behavior
Starting date	October 2008
Contact information	Yuri A. Amirkhanian, PhD. Medical College of Wisconsin
Boyer 2010	
Notes	

Boyer 2010

Trial name or title	Preventing Health Damaging Behaviors in Male and Female Army Recruits
Methods	Randomised efficacy study
Participants	Male and female U.S. Army soldiers who are receiving Advance Individual Training (AIT) in Fort Jackson, SC
Interventions	Behavioral: Staying Safe & In Control: Increasing Knowledge and Building Skills to Prevent STIs and Unintended Pregnancy
Outcomes	Primary outcome:incidence of sexually transmitted infections and the self-reported numbers of unintended pregnancies. Secondary outcome: self-reported behavioral measures related to STI/HIV prevention

Boyer 2010 (*Continued*)

Starting date	September 2010
Contact information	Principal investigator: Cherrie B Boyer, PhD. University of California, San Francisco boyerc@peds.ucsf.edu
Boyer 2010	
Notes	

DATA AND ANALYSES

Comparison 1. Voluntary Counselling and Testing on site Vs Voucher for off-site VCT

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Uptake of testing	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected

Comparison 2. Voluntary Counselling and Testing Vs no VCT

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 HIV incidence per 100 person-years	1		Risk Ratio (Fixed, 95% CI)	Totals not selected
2 Self-reported Sexually transmitted Infections	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
3 Unprotected sex	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
4 Unprotected sex with sex worker	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
5 Sex with Commercial sex worker	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
6 Alcohol use before sex	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected

Comparison 3. Education vs No Intervention

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Unprotected sex	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
2 Multiple sexual partners	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected

Comparison 4. Education and training Vs Alternative education

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Sexually transmitted infections (STIs)	1	895	Risk Ratio (M-H, Random, 95% CI)	0.68 [0.48, 0.96]
2 Unprotected sex	3	1047	Std. Mean Difference (IV, Fixed, 95% CI)	-0.17 [-0.29, -0.05]
3 Unprotected sex	1	1342	Risk Ratio (M-H, Random, 95% CI)	0.96 [0.90, 1.02]
4 Unprotected sex with commercial sex worker	1	568	Mean Difference (IV, Fixed, 95% CI)	-0.16 [-0.37, 0.05]

5 Multiple sexual partners	3	1048	Mean Difference (IV, Random, 95% CI)	-0.22 [-0.52, 0.08]
6 Multiple sexual partners	1	1342	Risk Ratio (M-H, Random, 95% CI)	1.04 [0.95, 1.15]
7 Sex with commercial sex worker	1	250	Risk Ratio (M-H, Random, 95% CI)	0.88 [0.81, 0.96]
8 Alcohol use before sex	2	880	Mean Difference (IV, Fixed, 95% CI)	-0.01 [-0.11, 0.08]

Analysis 1.1. Comparison 1 Voluntary Counselling and Testing on site Vs Voucher for off-site VCT, Outcome 1 Uptake of testing.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 1 Voluntary Counselling and Testing on site Vs Voucher for off-site VCT

Outcome: 1 Uptake of testing

Study or subgroup	On site VCT n/N	Off site VCT voucher n/N	Risk Ratio M-H,Fixed,95% CI	Risk Ratio M-H,Fixed,95% CI
Corbett 2006	1957/3950	125/3532		14.00 [11.75, 16.68]

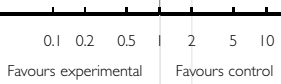
Analysis 2.1. Comparison 2 Voluntary Counselling and Testing Vs no VCT, Outcome 1 HIV incidence per 100 person-years.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 2 Voluntary Counselling and Testing Vs no VCT

Outcome: 1 HIV incidence per 100 person-years

Study or subgroup	log [Risk Ratio] (SE)	Risk Ratio IV,Fixed,95% CI	Risk Ratio IV,Fixed,95% CI
Corbett 2006	0.364643 (0.320998)		1.44 [0.77, 2.70]

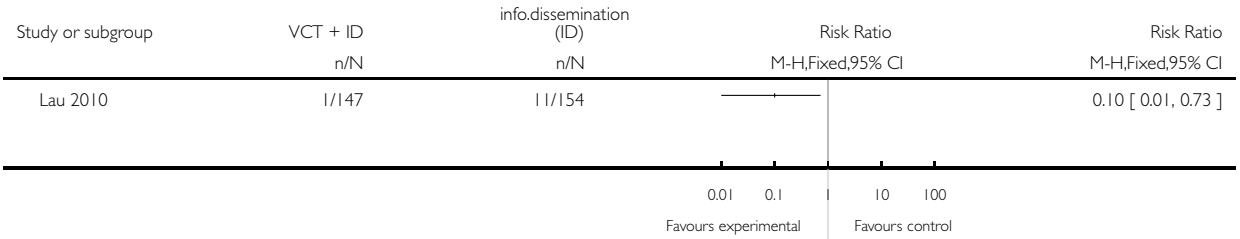


Analysis 2.2. Comparison 2 Voluntary Counselling and Testing Vs no VCT, Outcome 2 Self-reported Sexually transmitted Infections.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 2 Voluntary Counselling and Testing Vs no VCT

Outcome: 2 Self-reported Sexually transmitted Infections

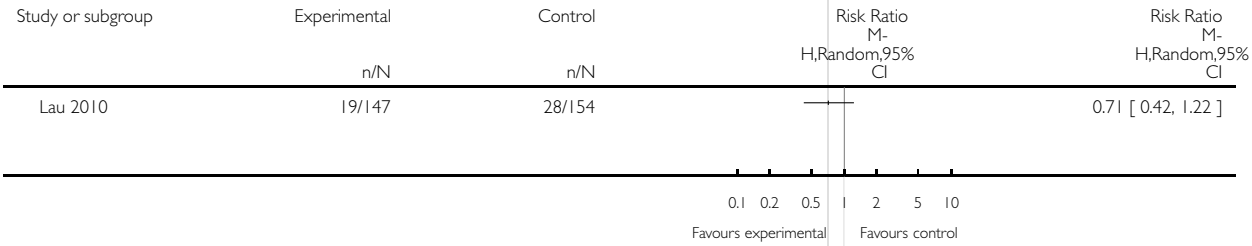


Analysis 2.3. Comparison 2 Voluntary Counselling and Testing Vs no VCT, Outcome 3 Unprotected sex.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 2 Voluntary Counselling and Testing Vs no VCT

Outcome: 3 Unprotected sex

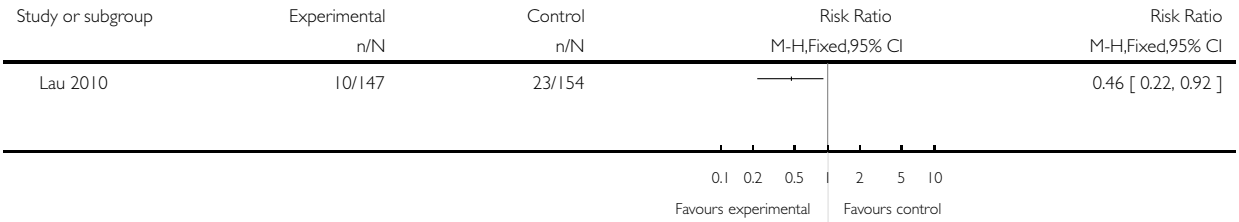


Analysis 2.4. Comparison 2 Voluntary Counselling and Testing Vs no VCT, Outcome 4 Unprotected sex with sex worker.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 2 Voluntary Counselling and Testing Vs no VCT

Outcome: 4 Unprotected sex with sex worker

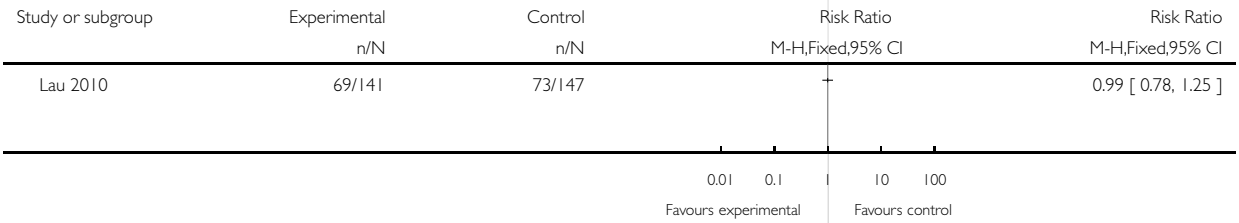


Analysis 2.5. Comparison 2 Voluntary Counselling and Testing Vs no VCT, Outcome 5 Sex with Commercial sex worker.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 2 Voluntary Counselling and Testing Vs no VCT

Outcome: 5 Sex with Commercial sex worker

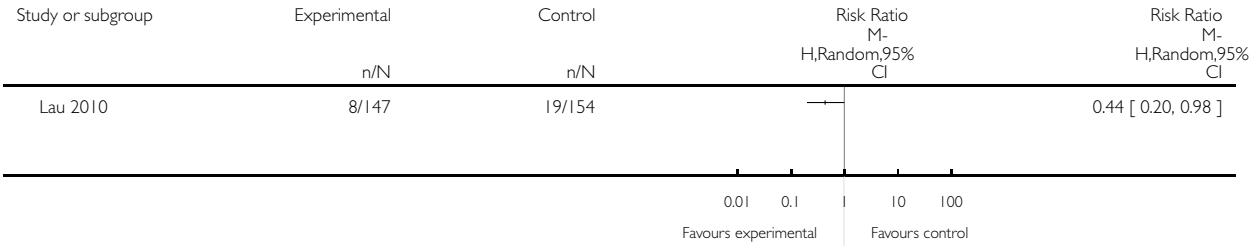


Analysis 2.6. Comparison 2 Voluntary Counselling and Testing Vs no VCT, Outcome 6 Alcohol use before sex.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 2 Voluntary Counselling and Testing Vs no VCT

Outcome: 6 Alcohol use before sex

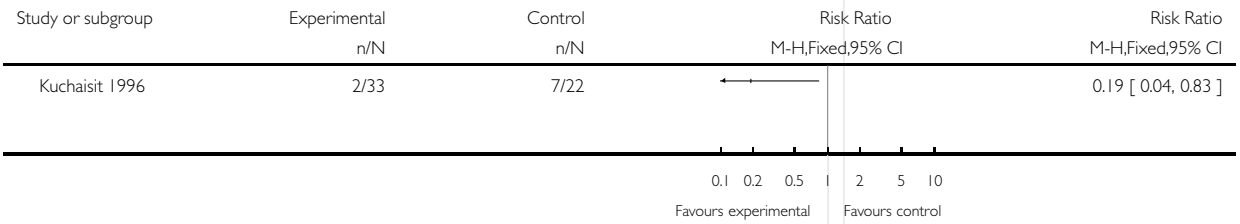


Analysis 3.1. Comparison 3 Education vs No Intervention, Outcome 1 Unprotected sex.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 3 Education vs No Intervention

Outcome: 1 Unprotected sex



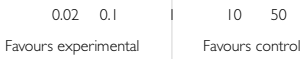
Analysis 3.2. Comparison 3 Education vs No Intervention, Outcome 2 Multiple sexual partners.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 3 Education vs No Intervention

Outcome: 2 Multiple sexual partners

Study or subgroup	Education n/N	No Intervention n/N	Risk Ratio M-H,Fixed,95% CI	Risk Ratio M-H,Fixed,95% CI
Kuchaisit 1996	7/33	10/22		0.47 [0.21, 1.04]



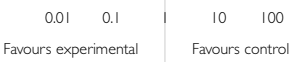
Analysis 4.1. Comparison 4 Education and training Vs Alternative education, Outcome 1 Sexually transmitted infections (STIs).

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 4 Education and training Vs Alternative education

Outcome: 1 Sexually transmitted infections (STIs)

Study or subgroup	Experimental n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Boyer 2004	47/435	73/460		100.0 %	0.68 [0.48, 0.96]
Total (95% CI)	**435**	**460**		**100.0 %**	**0.68 [0.48, 0.96]**
Total events: 47 (Experimental), 73 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 2.20 (P = 0.028)					
Test for subgroup differences: Not applicable					



Analysis 4.2. Comparison 4 Education and training Vs Alternative education, Outcome 2 Unprotected sex.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 4 Education and training Vs Alternative education

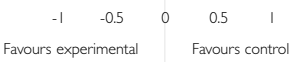
Outcome: 2 Unprotected sex

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
Bing 2008	280	0.1 (0.9)	288	0.2 (1)		54.4 %	-0.10 [-0.27, 0.06]
Commann 2007	83	1.64 (0.34)	84	1.74 (0.34)		15.9 %	-0.29 [-0.60, 0.01]
Essien 2010	160	3.86 (2.51)	152	4.47 (2.81)		29.7 %	-0.23 [-0.45, -0.01]
Total (95% CI)	**523**		**524**			**100.0 %**	**-0.17 [-0.29, -0.05]**

Heterogeneity: Chi^2 = 1.49, df = 2 (P = 0.47); I^2 =0.0%

Test for overall effect: Z = 2.77 (P = 0.0056)

Test for subgroup differences: Not applicable



Analysis 4.3. Comparison 4 Education and training Vs Alternative education, Outcome 3 Unprotected sex.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 4 Education and training Vs Alternative education

Outcome: 3 Unprotected sex

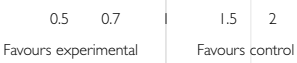
Study or subgroup	Experimental n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Boyer 2004	474/671	495/671		100.0 %	0.96 [0.90, 1.02]
Total (95% CI)	**671**	**671**		**100.0 %**	**0.96 [0.90, 1.02]**

Total events: 474 (Experimental), 495 (Control)

Heterogeneity: not applicable

Test for overall effect: Z = 1.28 (P = 0.20)

Test for subgroup differences: Not applicable



Analysis 4.4. Comparison 4 Education and training Vs Alternative education, Outcome 4 Unprotected sex with commercial sex worker.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 4 Education and training Vs Alternative education

Outcome: 4 Unprotected sex with commercial sex worker

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Bing 2008	280	0.04 (0.4)	288	0.2 (1.8)		100.0 %	-0.16 [-0.37, 0.05]
Total (95% CI)	**280**		**288**			**100.0 %**	**-0.16 [-0.37, 0.05]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.47 (P = 0.14)

Test for subgroup differences: Not applicable

Analysis 4.5. Comparison 4 Education and training Vs Alternative education, Outcome 5 Multiple sexual partners.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 4 Education and training Vs Alternative education

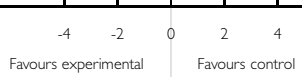
Outcome: 5 Multiple sexual partners

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Bing 2008	280	0.1 (0.5)	288	0.2 (1.1)		48.9 %	-0.10 [-0.24, 0.04]
Commann 2007	83	15.91 (5.76)	85	18.81 (5.76)		2.9 %	-2.90 [-4.64, -1.16]
Essien 2010	160	1.29 (0.77)	152	1.47 (0.56)		48.2 %	-0.18 [-0.33, -0.03]
Total (95% CI)	**523**		**525**			**100.0 %**	**-0.22 [-0.52, 0.08]**

Heterogeneity: $Tau^2 = 0.04$; $Chi^2 = 10.22$, df = 2 (P = 0.01); $I^2 = 80\%$

Test for overall effect: Z = 1.41 (P = 0.16)

Test for subgroup differences: Not applicable



Analysis 4.6. Comparison 4 Education and training Vs Alternative education, Outcome 6 Multiple sexual partners.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 4 Education and training Vs Alternative education

Outcome: 6 Multiple sexual partners

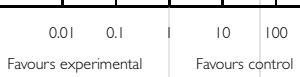
Study or subgroup	Experimental n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Boyer 2004	377/671	361/671		100.0 %	1.04 [0.95, 1.15]
Total (95% CI)	**671**	**671**		**100.0 %**	**1.04 [0.95, 1.15]**

Total events: 377 (Experimental), 361 (Control)

Heterogeneity: not applicable

Test for overall effect: Z = 0.88 (P = 0.38)

Test for subgroup differences: Not applicable



Analysis 4.7. Comparison 4 Education and training Vs Alternative education, Outcome 7 Sex with commercial sex worker.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 4 Education and training Vs Alternative education

Outcome: 7 Sex with commercial sex worker

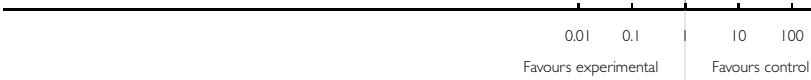
Study or subgroup	Experimental n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Cornmann 2007	104/125	118/125		100.0 %	0.88 [0.81, 0.96]
Total (95% CI)	**125**	**125**		**100.0 %**	**0.88 [0.81, 0.96]**

Total events: 104 (Experimental), 118 (Control)

Heterogeneity: not applicable

Test for overall effect: Z = 2.76 (P = 0.0057)

Test for subgroup differences: Not applicable

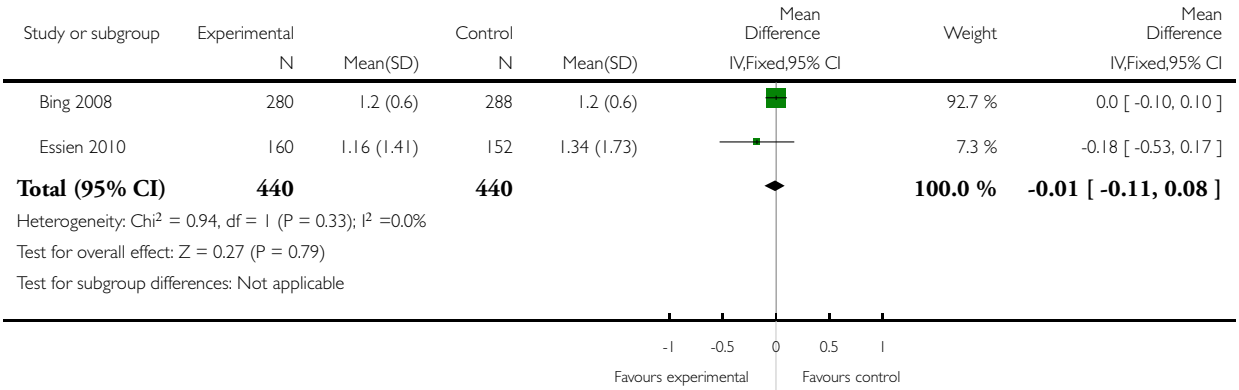


Analysis 4.8. Comparison 4 Education and training Vs Alternative education, Outcome 8 Alcohol use before sex.

Review: Interventions to reduce risky sexual behaviour for preventing HIV infection in workers in occupational settings

Comparison: 4 Education and training Vs Alternative education

Outcome: 8 Alcohol use before sex



ADDITIONAL TABLES

Table 1. Content of the educational / behavioural interventions

Study	Intervention type	Content of intervention	Frequency	Duration of intervention	Type of sessions	Leader	Follow ups
Kuchaisit 1996	Education	20 minutes presentation using slides, brochures, 2 way communication regarding AIDS, correct use of condoms, and posters exhibition	1 session	2 weeks	Group		1 follow up at 12 months.
Cornmann 2007	Information-Motivation and Behavioural skills	Educational sessions, behavioral skills training on con-	1 session	4 hours	Group session	Trained social worker	1 follow up at 10 months.

Table 1. Content of the educational / behavioural interventions (*Continued*)

		dom use, HIV risk reduction skills, safer sex communication skills, role play, condom distribution					
Corbett 2006	Voluntary counselling and testing (VCT)	Onsite Voluntary Counselling and Testing	At least 1 session per person.	10 weeks and 2 years of follow-up	Individual	Trained counsellor	Follow up was calculated using 100-person years follow up for HIV incidence
Bassett 1998	Peer education	Peer education, group discussions, video and slide shows, VCT, condom distribution, role play, 2 presentations by persons living with HIV	Every 6 months		Group	Peer educator	
Bing 2008	Information, motivation and behavior skills (IMB)	Information on HIV symptoms, transmission, prevention and treatment; skills training on correct condom use, and promotion, HIV risk reduction skills, condom distribution, negotiation for safe sex, small group discussion and role play	5 sessions+ 5 booster sessions during follow up	4 hours per session	Group	Local civilian facilitator	2 follow ups; 1st=3 months, 2nd=-6 months.

Table 1. Content of the educational / behavioural interventions (*Continued*)

Lau 2010	Voluntary counselling and testing (VCT) + information dissemination	Voluntary counselling and testing; Information dissemination on HIV prevention using 3 information leaflets and a letter from HIV+ patient; and condom promotion	30-40 minutes	1 VCT session	Individual	Well trained HIV field worker	2 follow ups, 1st=average of 4.45(intervention), 4.41 (control) and 2nd=8.95 (intervention) and 8.93 (control)
Essien 2010	Videotape based Information, motivation and behavioral skills (IMB) training	HIV education, risk sensitization, risk avoidance and risk management, use of male and female condoms, modelling, discussions, avoidance of substance abuse, sexual assertiveness and negotiation for safe sex	90 minutes	5 sessions	Group	2 female military officers trained as facilitators	2 follow ups;1st=3 months, 2nd=6 months.
Boyer 2004	Cognitive behavior-building based on IMB model	Educational sessions involving skills training on correct condom use, condom promotion, skills training for negotiation of safe sex, group discussions, cognitive behavioral	2 hours	4 sessions	Group	2 civilian facilitators	2 follow ups, 1st follow up=average of 1 month, 2nd follow up=average of 14 months

Table 1. Content of the educational / behavioural interventions (*Continued*)

		elements and HIV risk reduction skills					

Table 2. Risky sexual behaviour outcome categories and multiple questions asked by study authors

Outcome/ risky behaviour	Unprotected sex as proportion of all sex acts with non-sex worker	Unprotected sex as proportion of all sex acts with sex worker	Multiple Partners	Sex with commercial sex worker	Alcohol use before sex	STI	HIV	VCT uptake
Bing 2008	1. Number of unprotected vaginal sex acts with occasional sex partner in past 3 months (mean) [1] 2. Number of unprotected vaginal sex acts with girlfriends in past 3 months	1. Unprotected sex with commercial sex partner in past 3 months (mean)	1. Number of occasional and commercial sex partners in the past 3 months (mean)		1. Alcohol consumption before sex in past month			
Boyer 2004	1. Inconsistent use of condoms (yes)			1. Sexual intercourse with multiple sex partners (yes) 2. Sexual intercourse with casual sex partners		STI incidence		
Corbett 2006							HIV incidence	VCT proportion
Cornmann 2007	1. Frequency of		1. total number	1. Sex with commercial				

Table 2. Risky sexual behaviour outcome categories and multiple questions asked by study authors (*Continued*)

	condom use with non-marital partners (never to always) 2. Number of times condoms used with non marital partners in past 4 months (mean) 3. Total number of times condoms were used in past 4 months with marital partner (mean) 4. Had used condom with wife in past 4 months (yes)		of non-marital sex partners in past 4 months (mean) 2. sex with someone other than wife in past 4 months (yes)	sex workers in past four months (yes)				
Essien 2010	1. Vaginal sex without condom in past 3 months (mean) 2. Condom use, composite scale (0-21) 3. Vaginal sex with condom in past 3 months (mean)		1. Number of sexual partners		1. Alcohol use before sex (mean number of times)			
Kuchaisit 1996	1. Unprotected sex		1. Sex with extra partner					

Table 2. Risky sexual behaviour outcome categories and multiple questions asked by study authors (*Continued*)

Lau 2010	1. Used condoms consistently with non-regular female sex partner 2. Used condom consistently with non-regular partner last episode 3. Used condoms consistently with girlfriends in China 4. Used condoms consistently with Regular Partner	1. Used condoms consistently with female sex workers (FSW) in mainland China (yes) 2. Used condoms with FSW in China last episode (yes) 3.Used condoms etc with FSW in Hong Kong	1. Having non-regular partner in mainland China	1. Visited female sex worker in mainland China	1. Drank alcohol frequently before having sex with FSW in China	1. Self reported STI		

1. The question asked by the study authors that fits best the specific outcome category as defined by us is listed as number one. We used only the answers to that question for that category in the analysis.

Table 3. GRADE: Quality of evidence

Comparison and outcomes	Risk of bias	Heterogeneity I^2 > 50%	Indirectness	Precision	Publication bias (Funnel plot)	Quality of evidence
1. Voluntary counselling and testing on site versus Voucher for off-site VCT						
1.1 Uptake of testing	1 study high RoB	NA	no	precise	NA	downgraded to moderate because of limitations
2. Voluntary counselling and testing versus no VCT						
2.1 HIV incidence	1 study high RoB	NA	no	imprecise	NA	downgraded to low because of limitations and imprecision
2.2 STI	1 study high RoB	NA	no	imprecise	NA	downgraded to low because of limitations

Table 3. GRADE: Quality of evidence (*Continued*)

						and imprecision
2.3 Unprotected sex	1 study high RoB	NA	no	imprecise	NA	downgraded to low because of limitations and imprecision
2.4 Unprotected sex sex-worker	1 study high RoB	NA	no	imprecise	NA	downgraded to low because of limitations and imprecision
2.5 Sex with sex worker	1 study high RoB	NA	no	imprecise	NA	downgraded to low because of limitations and imprecision
2.6 Alcohol before sex	1 study high RoB	NA	no	imprecise	NA	downgraded to low because of limitations and imprecision
3.1 Unprotected sex	1 study high RoB	NA	no	imprecise	NA	Downgraded to very low because of serious limitations and imprecision
3.2 Multiple sex partners	1 study high RoB	NA	no	imprecise	NA	Downgraded to very low because of serious limitations and imprecision
4. Education & training Vs Alternative education						
4.2. Unprotected sex	3 studies with high ROB	28%	no	precise	Not possible to determine	Downgraded to low because of serious limitations in the studies
4.4 Unprotected sex sex-worker	1 study with high ROB	NA	no	imprecise	NA	Downgraded to low because of limitations and imprecision
4.5. Multiple sex partners	3 studies with high ROB	80%	no	low	Not possible to determine	Downgraded to low because of limitations and heterogeneity
4.7 Sex with sex worker	1 study with high ROB	NA	no	precise	NA	Downgraded to low because of limitations and imprecision

Table 3. GRADE: Quality of evidence (*Continued*)

4.8. Alcohol before sex	2 studies with high ROB	0%	no	low	Not possible to determine	Downgraded to low because of serious limitations in the studies

APPENDICES

Appendix 1. Medline(PubMed) search strategies

Search strategy1
19.8.2010/LI
#1
HIV Infections[MeSH] OR HIV[MeSH] OR hiv[tw] OR hiv-1*[tw] OR hiv-2*[tw] OR hiv1[tw] OR hiv2[tw] OR hiv infect*[tw] OR human immunodeficiency virus[tw] OR human immunedeficiency virus[tw] OR human immuno-deficiency virus[tw] OR human immune-deficiency virus[tw] OR ((human immun*) AND (deficiency virus[tw])) OR acquired immunodeficiency syndrome[tw] OR acquired immunedeficiency syndrome[tw] OR acquired immuno-deficiency syndrome[tw] OR acquired immune-deficiency syndrome[tw] OR ((acquired immun*) AND (deficiency syndrome[tw])) OR "sexually transmitted diseases, viral"[MESH:NoExp]
Results: 261397
#2
work[tw] OR works*[tw] OR work'*[tw] OR worka*[tw] OR worke*[tw] OR workg*[tw] OR worki*[tw] OR workl*[tw] OR workp*[tw] OR occupation*[tw]
Results: 851496
#3
randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized[tiab] OR placebo[tiab] OR clinical trials as topic[mesh: noexp] OR randomly[tiab] OR trial[ti] NOT (animals[mh] NOT humans [mh])

Results: 653933
#4
#1 AND #2 AND #3
Results: 881
#5
"sex workers" OR "sex worker" OR sharps OR needlestick
Results: 5689
#6
#4 NOT #5
Results: 741

Copy and paste to PubMed to see current results

((HIV Infections[MeSH] OR HIV[MeSH] OR hiv[tw] OR hiv-1*[tw] OR hiv-2*[tw] OR hiv1[tw] OR hiv2[tw] OR hiv infect*[tw] OR human immunodeficiency virus[tw] OR human immunedeficiency virus[tw] OR human immuno-deficiency virus[tw] OR human immune-deficiency virus[tw] OR ((human immun*) AND (deficiency virus[tw])) OR acquired immunodeficiency syndrome[tw] OR acquired immunedeficiency syndrome[tw] OR acquired immuno-deficiency syndrome[tw] OR acquired immune-deficiency syndrome[tw] OR ((acquired immun*) AND (deficiency syndrome[tw])) OR "sexually transmitted diseases, viral"[MESH:noexp]) AND (work[tw] OR works*[tw] OR work'*[tw] OR worka*[tw] OR worke*[tw] OR workg*[tw] OR worki*[tw] OR workl*[tw] OR workp*[tw] OR occupation*[tw]) AND (randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized[tiab] OR

placebo[tiab] OR clinical trials as topic[mesh:noexp] OR randomly[tiab] OR trial[ti] NOT (animals[mh] NOT humans[mh])))) NOT ("sex workers" OR "sex worker" OR sharps OR needlestick)

Search strategy 2
19.8.2010/LI

#1
HIV Infections[MeSH] OR HIV[MeSH] OR hiv[tw] OR hiv-1*[tw] OR hiv-2*[tw] OR hiv1[tw] OR hiv2[tw] OR hiv infect*[tw] OR human immunodeficiency virus[tw] OR human immunedeficiency virus[tw] OR human immuno-deficiency virus[tw] OR human immune-deficiency virus[tw] OR ((human immun*) AND (deficiency virus[tw])) OR acquired immunodeficiency syndrome[tw] OR acquired immunedeficiency syndrome[tw] OR acquired immuno-deficiency syndrome[tw] OR acquired immune-deficiency syndrome[tw] OR ((acquired immun*) AND (deficiency syndrome[tw])) OR "sexually transmitted diseases, viral"[MESH:NoExp]
Results: 261397
#2
prevent* AND intervent*
97985
#3
occupat* OR worker* OR workplace* OR "work place" OR worksite* OR worker* OR workers* OR "work site" OR "work sites" OR "work places"
323596
#4
"sex workers" OR "sex worker" OR sharps OR needlestick
5689
#5
(#1 AND #2 AND #3) NOT #4
Results: 485

Copy and paste to PubMed to see current results

((HIV Infections[MeSH] OR HIV[MeSH] OR hiv[tw] OR hiv-1*[tw] OR hiv-2*[tw] OR hiv1[tw] OR hiv2[tw] OR hiv infect*[tw] OR human immunodeficiency virus[tw] OR human immunedeficiency virus[tw] OR human immuno-deficiency virus[tw] OR human immune-deficiency virus[tw] OR ((human immun*) AND (deficiency virus[tw])) OR acquired immunodeficiency syndrome[tw] OR acquired immunedeficiency syndrome[tw] OR acquired immuno-deficiency syndrome[tw] OR acquired immune-deficiency syndrome[tw] OR ((acquired immun*) AND (deficiency syndrome[tw])) OR "sexually transmitted diseases, viral"[MESH:noexp]) AND ((prevent*) AND (intervent*)) AND (occupat* OR worker* OR workplace* OR "work place" OR worksite* OR worker* OR workers* OR "work site" OR "work sites" OR "work places")) NOT ("sex workers" OR "sex worker" OR sharps OR needlestick)

Appendix 2. EMBASE(embase.com) search strategy

31.8.2010/LI
#1
('human immunodeficiency virus infection'/exp OR 'human immunodeficiency virus'/exp OR hiv:ti OR hiv:ab OR 'hiv-1':ti OR 'hiv-1':ab OR 'hiv-2':ti OR 'hiv-2':ab OR 'human immunodeficiency virus':ti OR 'human immunodeficiency virus':ab OR 'human immunodeficiency virus':ti OR 'human immuno-deficiency virus':ab OR 'human immunedeficiency virus':ti OR 'human immunedeficiency virus':ab OR 'human immune-deficiency virus':ti OR 'human immune-deficiency virus':ab OR 'acquired immune-deficiency syndrome':ti OR 'acquired immune-deficiency syndrome':ab OR 'acquired immunedeficiency syndrome':ti OR 'acquired immunedeficiency syndrome':ab OR 'acquired immunodeficiency syndrome':ti OR 'acquired immunodeficiency syndrome':ab OR 'acquired immunodeficiency syndrome':ti OR 'acquired immuno-deficiency syndrome':ab) AND [embase]/lim
result 227,029
#2

(random*:ti OR random*:ab OR factorial*:ti OR factorial*:ab OR 'cross over':ti OR 'cross over':ab OR crossover*:ti OR crossover*:ab OR placebo:ti OR placebo:ab OR (doubl*:ti AND blind*:ti) OR (doubl*:ab AND blind*:ab) OR (singl*:ti AND blind*:ti) OR (singl*:ab AND blind*:ab) OR assign*:ti OR assign*:ab OR volunteer*:ti OR volunteer*:ab OR 'crossover procedure'/de OR 'double-blind procedure'/de OR 'single-blind procedure'/de OR 'randomized controlled trial'/de OR allocat*:ti OR allocat*:ab) AND [embase]/lim

result 805,387

#3

(work*:ti OR work*:ab OR occupation*:ti OR occupation*:ab OR 'work environment'/de OR 'work'/de OR 'workplace'/exp OR 'occupation and occupation related phenomena'/de OR 'occupation'/exp OR 'occupational health'/exp) AND [embase]/lim

result 700,463

#4

#1 AND #2 AND #3

result 1018

#5

('sex worker' OR 'sex workers' OR 'needle stick'/exp OR 'needle stick' OR 'needle sticks' OR 'needlestick injury'/exp OR 'needlestick injury' OR 'needlestick injuries'/exp OR 'needlestick injuries' OR sharps) AND [embase]/lim

result 4,047

#6

#4 NOT #5

result 848

Appendix 3. CENTRAL (The Cochrane Library) search strategy

9.9.2010/LI

#1

hiv OR hiv1* OR hiv2* OR (HUMAN next IMMUN?DEFICIENCY next VIRUS) OR (HUMAN next IMMUN? next DEFICIENCY next VIRUS) OR (ACQUIRED next IMMUN?DEFICIENCY next SYNDROME) OR (ACQUIRED next IMMUN* next DEFICIENCY next SYNDROME)

9324

#2

MeSH descriptor HIV Infections explode all trees

6194

#3

MeSH descriptor HIV explode all trees

1953

#4

#1 OR #2 OR #3

9400

#5

(sex next worker*) OR needlestick* OR (needle next stick*) OR sharps 1747

#6

#4 NOT #5

9234

#7

work* OR occupation*

31773

#8

#6 AND #7

785

(#8) in "Cochrane Central Register of Controlled Trials" 290

DARE(The Cochrane Library) search strategy

(#8) in "Database of Abstracts of Reviews of Effects" 55

Appendix 4. CINAHL(EBSCOhost) search strategy

Advanced Search 4.10.2010/LI
S1
(MH "HIV Infections+") OR (MH "HIV-1") OR (MH "Human Immunodeficiency Virus")
38270
S2
(TI hiv OR hiv-1 OR hiv-2 OR human immunodeficiency virus OR human immuno-deficiency virus OR human immunedeficiency virus OR human immune-deficiency virus OR acquired immune-deficiency syndrome OR acquired immunedeficiency syndrome OR acquired immunodeficiency syndrome OR acquired immuno-deficiency syndrome)
25392
S3
(AB hiv OR hiv-1 OR hiv-2 OR human immunodeficiency virus OR human immuno-deficiency virus OR human immunedeficiency virus OR human immune-deficiency virus OR acquired immune-deficiency syndrome OR acquired immunedeficiency syndrome OR acquired immunodeficiency syndrome OR acquired immuno-deficiency syndrome)
18368
S4
S1 OR S2 OR S3 46044
S5
(MH "Clinical Trials+")
86766
S6
(TI random* OR factorial* OR cross over OR crossover* OR placebo OR (doubl* AND blind*) OR (singl* AND blind*) OR assign* OR volunteer* OR allocat*)
26448
S7
(AB random* OR factorial* OR cross over OR crossover* OR placebo OR (doubl* AND blind*) OR (singl* AND blind*) OR assign* OR volunteer* OR allocat*)
93586
S8
S5 OR S6 OR S7
150822
S9
(TI work* OR occupation*)
66451
S10
(AB work* OR occupation*)
116957
S11
(MH "Occupations and Professions+") OR (MH "Work Environment") OR (MH "Work")
47991
S12
S9 OR S10 OR S11
195105
S13
S4 AND S8 AND S12
333
S14
TX sex worker OR sex workers OR needle stick OR needle sticks OR needlestick injury OR needlestick injuries OR sharps
3855

S15
S13 NOT S14
285

Appendix 5. PsycINFO(OvidSP) search strategy

Advanced search, map term to subject heading, 18.3.2011/LI

Searches	Results
1 exp HIV Testing/ or exp HIV/ or hiv.mp.	30925
2 exp AIDS/ or exp AIDS Prevention/	15032
3 1 or 2	31263
4 exp Occupations/ or occupation*.mp. or exp Working Conditions/ or work*.mp.	415880
5 3 and 4	5551
6 (sex worker* or needlestick or needle stick* or sharps).mp. [mp=title, abstract, heading word, table of contents, key concepts]	1179
7 5 not 6	4822
8 (animals not humans).mp.	43333
9 7 not 8	4812
10 (random* or factorial* or crossover* or cross over* or placebo* or double blind* or single blind* or assign* or allocat* or volunteer*).mp.	184512
11 (randomized controlled trial or controlled clinical trial).mp. or randomized.ab,ti. or placebo.ab,ti. or clinical trials.mp. or randomly.ab,ti. or trial.ti.	90281
12 10 or 11	194057
13 9 and 12	424
14 13	424
15 limit 14 to all journals	303

Appendix 6. OSH Update (all databases incl. CISDOC, HSELINE, NIOSHTIC, NIOSHTIC-2, RILOSH) strategy

22.9.2010/LI
#1
AB{hiv OR hiv-1* OR hiv-2* OR hiv1 OR hiv2 OR HUMAN IMMUNODEFICIENCY VIRUS OR HUMAN IMMUNEDEFICIENCY VIRUS OR HUMAN IMMUNE-DEFICIENCY VIRUS OR HUMAN IMMUNO-DEFICIENCY VIRUS OR HUMAN IMMUN* DEFICIENCY VIRUS OR ACQUIRED IMMUNODEFICIENCY SYNDROME OR ACQUIRED IMMUNEDEFICIENCY SYNDROME OR ACQUIRED IMMUNO-DEFICIENCY SYNDROME OR ACQUIRED IMMUNE-DEFICIENCY SYNDROME OR ACQUIRED IMMUN* DEFICIENCY SYNDROME}
2096
#2
TW{hiv OR hiv-1* OR hiv-2* OR hiv1 OR hiv2 OR HUMAN IMMUNODEFICIENCY VIRUS OR HUMAN IMMUNEDEFICIENCY VIRUS OR HUMAN IMMUNE-DEFICIENCY VIRUS OR HUMAN IMMUNO-DEFICIENCY VIRUS OR HUMAN IMMUN* DEFICIENCY VIRUS OR ACQUIRED IMMUNODEFICIENCY SYNDROME OR ACQUIRED IMMUNEDEFICIENCY SYNDROME OR ACQUIRED IMMUNO-DEFICIENCY SYNDROME OR ACQUIRED IMMUNE-DEFICIENCY SYNDROME OR ACQUIRED IMMUN* DEFICIENCY SYNDROME}
1064
#3
DE{hiv OR hiv-1* OR hiv-2* OR hiv1 OR hiv2 OR HUMAN IMMUNODEFICIENCY VIRUS OR HUMAN IMMUNEDEFICIENCY VIRUS OR HUMAN IMMUNE-DEFICIENCY VIRUS OR HUMAN IMMUNO-DEFICIENCY VIRUS OR HUMAN IMMUN* DEFICIENCY VIRUS OR ACQUIRED IMMUNODEFICIENCY SYNDROME OR ACQUIRED IMMUNEDEFICIENCY SYNDROME OR ACQUIRED IMMUNO-DEFICIENCY SYNDROME OR ACQUIRED IMMUNE-DEFICIENCY SYNDROME OR ACQUIRED IMMUN* DEFICIENCY SYNDROME}
788

#4
#1 OR #2 OR #3
2761
#5
DE{"HEALTH CARE PERSONNEL" OR "HEALTH CARE PROFESSIONALS" OR "HEALTH CARE STAFF" OR "HEALTH CARE WORKER" OR "HEALTH CARE WORKERS" OR "HEALTH CARE PERSONEL" OR NURSES OR "NURSING PERSONNEL"}
5963
#6
GW{sex worker* OR sex-worker* OR needlestick* OR needle stick* OR needle-stick* OR sharps}
1548
#7
#5 OR #6
6918
#8
#4 NOT #7
1645
#9
GW{random* OR factorial* OR crossover* OR cross over* OR cross-over* OR placebo* OR double blind* OR double-blind* OR single blind* OR single-blind* OR assign* OR allocat* OR volunteer*} OR GW{controlled stud* OR controlled trial* OR clinical trial* OR time series} OR AB{before AND after}
29054
#10
#8 AND #9
42
#11
GW{intervention*}
7015
#12
#8 AND #11
46
#13
#10 OR #12
86
(GW denotes all fields TW denotes title words, and DE denotes descriptors

Appendix 7. LILACS (Bireme Virtual Health Library) search strategy

3.11.2010/LI
#1
([pt] " RANDOMIZED CONTROLLED TRIAL " or [pt] "CONTROLLED CLINICAL TRIAL " or [Mh] "RANDOMIZED CONTROLLED TRIALS AS TOPIC" or [Mh] "RANDOM ALLOCATION" or [Mh] "DOUBLE-BLIND METHOD" or [Mh] "SINGLE-BLIND METHOD") or ([Pt] "CLINICAL TRIAL" or [Ex] "E05.318.760.535$") or (clin$ and (trial$ or ensa$ or estud$ or experim$ or investiga$)) or ((singl$ or simple$ or doubl$ or doble$ or duplo$ or trebl$ or trip$) and (blind$ or cego$ or ciego$ or mask$ or mascar$)) or placebo$ or random$ or randon$ or casual$ or acaso$ or azar or aleator$ or [Mh] "RESEARCH DESIGN" or [pt] "COMPARATIVE STUDY" or [Ex] "E05.337$" or [Mh] "FOLLOW-UP STUDIES" or [Mh] "PROSPECTIVE STUDIES" or control$ or prospectiv$ or volunt$ or volunteer$
#2
[Mh]"HIV" or [Mh]"HIV Infections" or hiv or hiv-1 or hiv-2 or human immunodeficiency virus or human immuno-deficiency virus or human immunedeficiency virus or human immune-deficiency virus or acquired immune-deficiency syndrome or acquired immunedeficiency syndrome or acquired immunodeficiency syndrome or acquired immuno-deficiency syndrome or VIH or SIDA
#3

work$ or occupation$ or trabaj$ or trabal$ or ocupaci$
#4
#1 AND #2 AND #3
126

Appendix 8. EPPI-Centre databases search strategies

11.11.2010/LI
DoPHER(Database of Promoting Health Effectiveness Reviews)
1. Freetext: "hiv infections" OR "human immunodeficiency virus infection" OR "human immunodeficiency virus" OR hiv OR "hiv-1" OR "hiv-2" OR "human immuno-deficiency virus" OR "human immunedeficiency virus" OR "human immune-deficiency virus" OR "acquired immune-deficiency syndrome" OR "acquired immunedeficiency syndrome" OR "acquired immunodeficiency syndrome" OR "acquired immuno-deficiency syndrome"
199
2. Focus of the report: STD
259
3. Freetext: "work*" OR "occupation*"
482
4. Focus of the report: workplace
160
5. 1 OR 2
289
6. 3 OR 4
503
7. 5 AND 6
46
TRoPHI(Trials Register of Promoting Health Interventions)
1. Freetext: "hiv infections" OR "human immunodeficiency virus infection" OR "human immunodeficiency virus" OR hiv OR "hiv-1" OR "hiv-2" OR "human immuno-deficiency virus" OR "human immunedeficiency virus" OR "human immune-deficiency virus" OR "acquired immune-deficiency syndrome" OR "acquired immunedeficiency syndrome" OR "acquired immunodeficiency syndrome" OR "acquired immuno-deficiency syndrome"
398
2. Focus of the report: STD
483
3. Freetext: "work*" OR "occupation*"
816
4. Focus of the report: workplace
292
5. 1 OR 2
540
6. 3 OR 4
862
7. 5 AND 6
77
8. Freetext: "sex worker" OR "sex workers" OR "sharps" OR "needlestick*"
22
9. 7 NOT 8
58
Bibliomap
1. Freetext: "hiv infections" OR "human immunodeficiency virus infection" OR "human immunodeficiency virus" OR hiv OR "hiv-1" OR "hiv-2" OR "human immuno-deficiency virus" OR "human immunedeficiency virus" OR "human immune-deficiency virus" OR

"acquired immune-deficiency syndrome" OR "acquired immunedeficiency syndrome" OR "acquired immunodeficiency syndrome" OR "acquired immuno-deficiency syndrome"
1184
2. Focus of the report: STD
2098
3. Freetext: "work*" OR "occupation*"
2143
4. Focus of the report: workplace
1175
5. 1 OR 2
2163
6. 3 OR 4
2398
7. 5 AND 6
234
8. Freetext: "sex worker" OR "sex workers" OR "sharps" OR "needlestick*"
20
9. 7 NOT 8
216
10. What type of study does this report describe?: RCT
1707
11. 9 AND 10
17
Evidence Library
1. Health promotion keywords: HIV (5 reviews)

Appendix 9. COSH-databases search strategy

11.4.2011/LI
HIV* in all indexed fields OR HIV* in all non-indexed fields in all databases
OR
aids in all indexed fields OR aids in all non-indexed fields in all databases
results: 15/95 records

HISTORY

Protocol first published: Issue 2, 2005

Review first published: Issue 12, 2011

Date	Event	Description
8 November 2010	Amended	New author team taking the review forward. Protocol completely revised
11 November 2008	Amended	Converted to RevMan 5, and re-published without new citation

CONTRIBUTIONS OF AUTHORS

Olumuyiwa Ojo wrote the text of the protocol with contributions of the other authors based on a previous existing version written by Geoffrey Setswe. Leena Isotalo developed the search strategy.

DECLARATIONS OF INTEREST

There are no known conflicts of interest.

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Internal sources

- Cochrane Occupational Safety and Health Review Group, Finland.

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External sources

- No sources of support supplied

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We promised to look for non-randomised studies in case we find only few RCTs. Given the number found, we will not look for non-randomised studies anymore. We did not use GRADE Pro software like we promised.

INDEX TERMS

Medical Subject Headings (MeSH)

*Risk-Taking; *Workplace; Counseling; HIV Infections [epidemiology; *prevention & control; transmission]; Harm Reduction; Randomized Controlled Trials as Topic; Sexually Transmitted Diseases [epidemiology; prevention & control]; Unsafe Sex [*prevention & control]

MeSH check words

Humans