

Review of Behavioral Interventions for Reducing the Risk of HIV/AIDS in Occupational Settings

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Abstract

In this review, randomized controlled trials of behavioral interventions for reducing the risk of HIV in occupational settings, were systematically identified through electronic and hand searches, they were then classified and then assessed for methodological quality.

Data were analyzed using meta-analysis. This study found that condom use was the most effective intervention for reducing the risk of HIV infection among workers in occupational settings. The provision of Information, Education and Communications (IEC) material, reducing the number of sex partners, improving care for Sexually Transmitted Infections (STIs) and HIV, and increasing knowledge, Attitudes, Practices and Behaviors (KAPBs) were also effective in reducing the risk of HIV among workers.

Recommendations coming from this study have immediate implications for service delivery in occupational settings. Knowing which behaviour change intervention is most effective will assist employers in occupational settings in allocating resources appropriately.

Keywords: Behavior; HIV; Interventions; Occupational settings; Risk

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Introduction

At the end of 2014, about 35 million people were living with the Human Immuno Deficiency Virus (HIV), the virus that causes Acquired Immune Deficiency Syndrome (AIDS) [1]. HIV/AIDS is reported as the leading cause of death among the economically active people who are in the prime of their working lives. Every year, millions of workers become infected with HIV, mostly through behaviors that are preventable.

A report to the United Nations Special Session on HIV/AIDS in 2011, estimated that at least 23 million workers aged 15 to 49 years, carried the human immunodeficiency virus [2]. Employees in occupational settings engage in high-risk sexual behavior like other targets groups in society. Stephenson, Imrie and Sutton [3] believe that effective behavioral interventions to reduce sexual risk taking and infection with HIV are clearly needed. Occupational health services are an appropriate setting for such interventions.

Smart [4] Indicated that the impact of HIV/AIDS on employees within any workplace has certain common features. When HIV/AIDS morbidity begins, sick leave and other forms of absenteeism increase, overall productivity of workforce declines due to employee illness, overall labor costs increase, overtime and contractor's wages increase to compensate for absenteeism, additional use of medical aid benefits causes premiums to rise, managers begin to spend time and resources on HIV/AIDS-related issues.

There are a large number of behavioral prevention programs in workplaces all over the world. Although many workplaces are involved in ongoing evaluation of their own programs, it is not

known if there is any research which systematically evaluates the effectiveness and appropriateness of such programs and there are little data which can be used as a baseline for understanding behavior change among employees in occupational settings. This is symptomatic of a lack of a research tradition of behavioral interventions in general and the lack of significant involvement of behavioral scientists in HIV/AIDS in the world of work. This lack of research data contributes to a limited capacity to understand the effectiveness of behavioral interventions [5].

There is an increasing emphasis in many settings to base policy and practice decisions on evidence and the HIV policy and practice decisions in occupational settings need to be based on evidence. Evidence-informed decision-making is a cross-sectoral and multidisciplinary undertaking in which the views and experience of both providers and users of evidence are taken into consideration.

The purpose of this study was to review available evidence concerning behavior change interventions, and to evaluate their effectiveness in workers in occupational settings. This systematic review brought together the findings from a range of research done around behavioral interventions for reducing HIV/AIDS in occupational settings. In this study, the term systematic review refers to the entire process of collecting, reviewing and presenting all available evidence, while the term meta-analysis refers to the statistical technique involved in extracting and combining data to produce a summary result.

The search for available randomized controlled trials in this study was comprehensive as it involved both electronic and hand searches for interventions from around the world.

Methods

This review was conducted in four stages: identification of relevant studies, classification of these studies, quality assessment and extraction of data and analysis of findings. The co-reviewers in this study were an epidemiologist and a behavioral scientist and senior lecturer in public health. 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.

A highly sensitive search strategy was developed using a combination of controlled vocabulary and free-text terms. For PsychLIT, ERIC, Medline, EMBASE and the Social Science Citation Index, terms to denote “HIV behavioral” interventions (e.g. AIDS INTERVENTION; WORKPLACE AIDS POLICY; BEHAVIOUR; RISK REDUCTION; aids* behavior*; prev* interv*; occup* setting) will be combined with a wide range of general and specific health promotion terms (e.g. AIDS PREVENTION, AIDS EDUCATION). The specialized registers will be searched using the free-text term “intervention*”.

Search strategies for commercially available electronic databases covered EMBASE (1990 to June 2003); ERIC (1992 to June 2003); Medline (1965 to June 2003); PsycLIT (1970 to June 2003) and the Social Citation Index (1981 to June 2003). The same search strategy was used for each of the databases.

The HIVSA research databases of the Social Science Research Unit at the University of London and the AIDS Research Institute at the University of the Witwatersrand were specifically used to track down unpublished reports of completed and on-going behavioral interventions in occupational settings. Well-known databases relevant to unpublished work such as the System for Information on Grey Literature in Europe (SIGLE) were searched for grey literature. A hand search of key HIV/AIDS research journals such as AIDS and the African Journal of AIDS Research was conducted.

Bibliographies of retrieved papers and authors for additional unpublished materials were scanned and where possible contacted. Conference proceedings for relevant abstracts were reviewed. Other proceedings that were searched included international HIV/AIDS conferences, international conferences on occupational health, international conferences on social and behavioral health sciences, and national conferences on HIV/AIDS. Colleagues and research organizations in the field of HIV/AIDS and behavioral research were consulted.

Completed trials that were never published and unpublished technical reports and dissertations were reviewed as well.

Two reviewers independently reviewed all abstracts for inclusion or exclusion and extracted data from included trials.

Once the abstracts that qualify for inclusion in the review have been identified, full articles were obtained from libraries.

Studies were assessed using an eligibility form. Two reviewers completed the process of validity assessment independently. If there were any disagreements, the third reviewer was invited as an arbiter. The eligibility form was used for evaluating whether studies qualified for inclusion. The authors of unpublished articles were contacted to obtain permission to use their articles in the review or to obtain additional information pertaining to their studies.

To be eligible for inclusion, studies needed to have the following criteria:

- Randomized controlled trials;
- Behavioral intervention;
- The outcome of the study was to reduce HIV risk or disease;
- Workers in occupational settings were the population of review;

Articles were considered relevant if they met all of the four criteria.

Employees or workers in occupational settings were the target population. The type of participants included workers in a variety of work settings such as mobile workers, persons working in the transport, fishing and tourism industries, health workers, civil servants, farm workers, military personnel, commercial sex workers and other workers who are at risk of exposure to HIV because of the nature of their work. Participants included workers in all age groups, both male and female, all race groups and workers from different regions of the world.

1.1 Data Extraction

Two reviewers extracted data independently. The other reviewer was consulted when there were disagreements. Data were extracted using a data extraction instrument. The data

extraction form contained about 6 core data elements. The core data elements included administrative details such as identity number, author(s) title and year of publication. Study details extract information about the origin of the study, format of the study and country or city where the study was conducted. Participant details included target population, occupational setting, gender, number of participants, number in the intervention and control groups. Intervention details include the type of intervention, intervention components, intervention focus and outcome types. There is a question on whether ethical approval had been obtained. The information required on the methods section includes the type of randomization used, allocation of concealment, loss to follow-up and blinding.

Results

Data were analyzed using meta-analysis to combine the results from a number of interventions examining behavioral interventions for reducing the risk of HIV in occupational settings. Meta-analysis is a statistical technique for combining the findings from several independent studies to assess the effectiveness of behavioral interventions for reducing the risk of HIV in occupational settings. This meta-analysis of studies provided a precise estimate of intervention effect, giving due weight to the size of the different studies included. It looked for the presence of heterogeneity and explored the robustness of the main findings using sensitivity analysis.

In all, 292 papers were identified. 13 studies were classified as Randomized Controlled Trials (RCTs), 24 were Quasi-Experimental Designs (QEDs), 46 were Cross-Sectional Studies (CSS), 17 were Behavioral Surveillance Surveys (BSS) and 10 were Workplace Policy Interventions (WPP). The other 182 studies were not relevant for this review because they did not meet the eligibility criteria. They were mainly qualitative reports, letters to editors or non-interventions.

The tables in this section are the results obtained following a meta-analysis of the thirteen intervention studies that have been included in this review. Each of the tables reflects a comparison

that was used in the study i.e. what the intervention group and/or control group were offered and how many participants were involved in each of the groups. The results also reflect the odds ratios or relative risks and 95% confidence intervals. These were calculated using either the fixed method or the random approach. There was a calculation of the weight percentage of each of the studies, indicating where two or more studies are involved which one was stronger, methodologically.

Bassett [6] conducted a randomized controlled intervention in 40 factories in Harare, Zimbabwe. 20 factories were randomly selected for a peer education intervention and 16 were used as controls. Peer educators were selected and trained over one week. They were trained on the role of a peer educator, HIV/AIDS epidemic, STD symptoms and treatment, HIV transmission, prevention and care. They were then deployed to supply free condoms at worksites, organize one drama and two presentations by PLWHA. The outcome of interest in this intervention was the incidence of HIV among factory workers. There was no difference in the incidence of HIV in factory workers who received or did not receive peer education.

Katzenstein et al. [7] conducted a randomized controlled trial in over 2,000 factory workers at 40 factories in Harare, Zimbabwe. The intervention consisted of HIV counseling and testing and peer education (intervention arm) versus HIV counseling and testing alone (control arm). Access to condoms and STI management was offered to both groups. The outcome of interest was HIV incidence among the HIV negative male factory workers who were enrolled in the study. HIV incidence in the intervention arm was 35% lower than incidence in workers from the control arm (2.21 vs. 3.20 per 100 person years, $p = .036$).

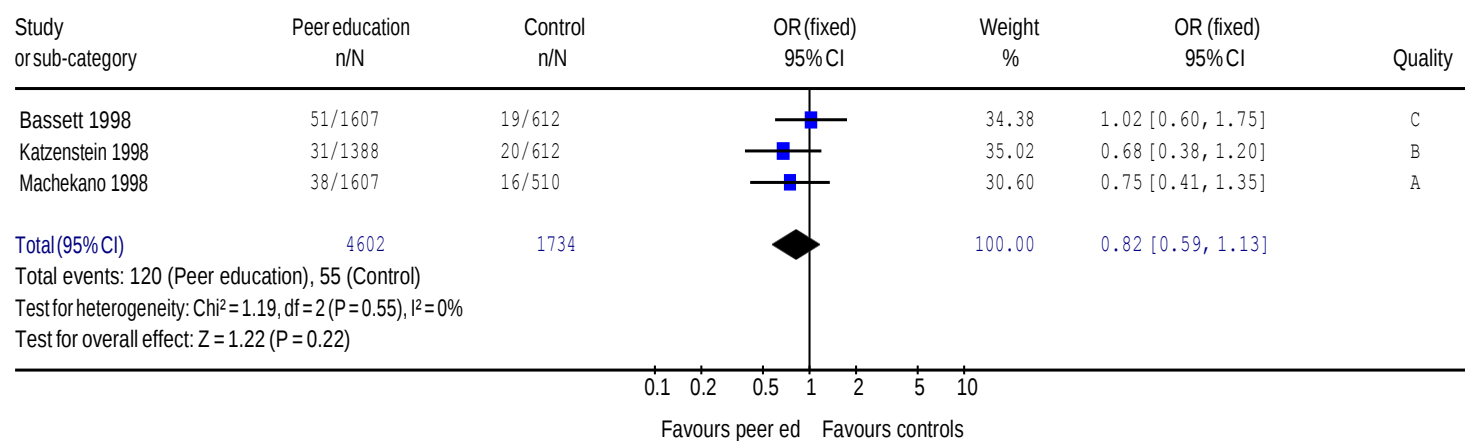
Machekano et al. [8] reported on an RCT of peer education conducted at 40 factories in Harare, Zimbabwe. This was a 3-year study to evaluate a workplace-based HIV/STD peer education and condom distribution program. 20 factories were assigned to receive assistance in developing establishing and maintaining a peer education program. The other 20 factories served as controls. There were 2,719 HIV negative male factory workers who enrolled from 40 factories. A total of 2,117 (77.9%) completed at least one follow up visit. HIV sero-incidence at peer education intervention factories was 2.35 per 100 person years vs. 3.11 per 100 per year at control factories.

Table I: HIV incidence in factory workers following peer education interventions

Review:
Behavioural interventions for reducing HIV risk or infection in employees in occupational settings

Comparison:
01 Peer education vscontrol

Outcome:
01 HIV incidence



The three peer education interventions conducted among factory workers in Harare were analyzed together. Peer education was effective in reducing HIV incidence in all three studies but more so in the Machekano et al. [8] study. Table I shows that factory workers had 30.6% chance of being infected with HIV with a CI of 0.75 [0.41, 1.35] compared to a 35% chance in the Katzenstein et al. [7] intervention, with a CI of 0.68 [0.38, 1.20]. Workers in the Bassett [6] intervention had a 34.4% chance of being infected with HIV with a CI of 1.02 [0.60, 1.75]. The differences in HIV incidence between the three studies were not statistically significant ($p = 0.22$).

Egger et al. [9] conducted a randomized controlled trial in 19 motels in Managua. The intervention was conducted in 11 motels and 8 motels served as controls. About 6,463 couples and sex workers who visit motels in Managua were involved in this intervention. Researchers gave couples condoms on request, made them available in rooms, or gave them directly with or without the presence of health education material in the rooms. Researchers used factorial design to assess condom use directly by searching the rooms after the couples had left. The outcome of interest was condom use between commercial and non-commercial partners.

Table II: Condom use in commercial and non-commercial sex

Review: Behavioural interventions for reducing HIV risk or infection in employees in occupational settings
Comparison: 02 Commercial sex vs non-comm sex
Outcome: 01 Condom use

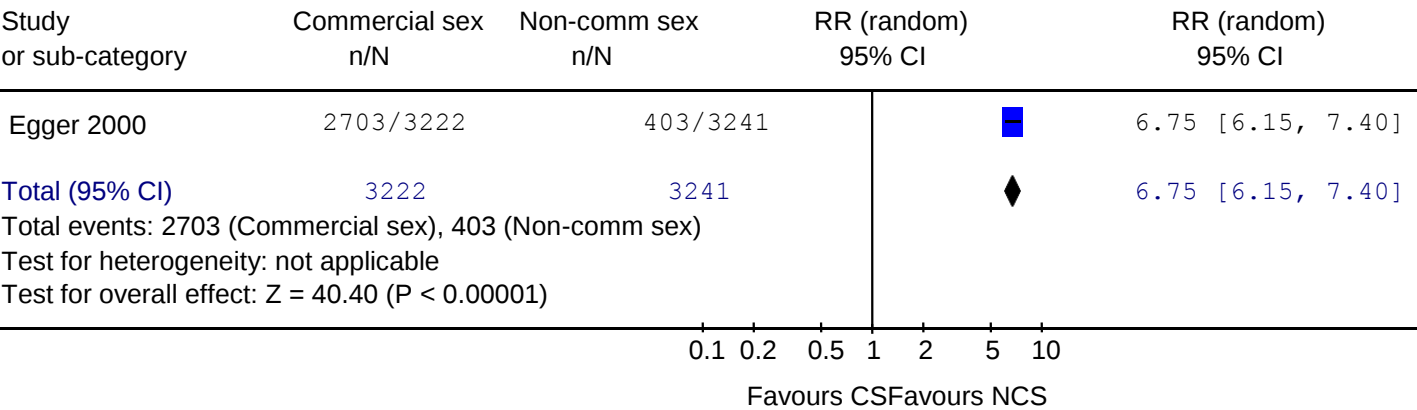


Table II shows that the relative risk of using condoms was seven times more for commercial sex than for non-commercial sex with a 95% Confidence Interval of 6.75 [6.15,7.40]. Couples who practiced non-commercial sex were seven times less likely to use condoms than couples that had multiple partners. This difference was statistically significant at $p < 0.00001$.

Gallop et al. [10] conducted a randomized trial of group interventions for hospital staff caring for persons with AIDS in

Ontario. The intervention consisted of a video session, AIDS patient video, stimulus cards and pre-post intervention questionnaire. A staff-patient interaction scale was used to measure behavior towards AIDS patients. Participants in this intervention were 183 male and female hospital workers in Ontario, Canada and the outcome of interest was knowledge, attitudes and behavior towards AIDS patients.

Table III: Knowledge of HIV/AIDS among hospital workers caring for PLWAs

Review:
Behavioural interventions for reducing HIV risk or infection in employees in occupational settings

Comparison:
03 Interventions vs Control

Outcome:
01 Knowledge about HIV/AIDS

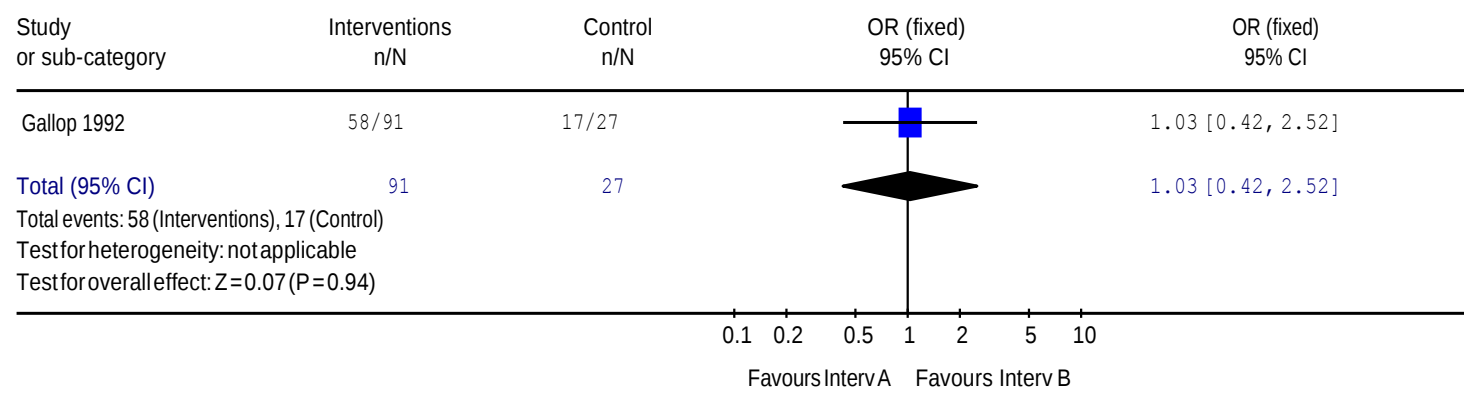


Table III shows that the intervention did not increase knowledge of HIV/AIDS among hospital workers who received the intervention and those who did not (Odds Ratio of 1.03 with a Confidence Interval of 0.42 to 2.52). There was no difference between knowledge levels of hospital workers who were exposed to the intervention and those who were in the control group (p = 0.94).

Gerbert et al. [11] conducted a controlled educational intervention to change dentists' knowledge, attitudes and behaviors relating to AIDS. Participants in this intervention

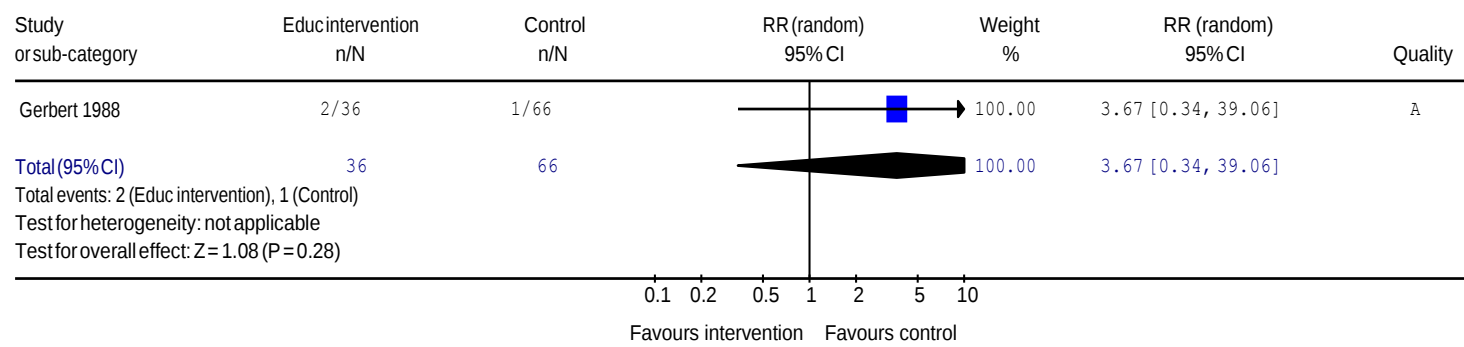
were 102 dentists at health settings in the USA. 36 participants were assigned to receive an educational intervention composed of 3 methods and the remaining 66 served as a control group, receiving no intervention. At post-test, 35 dentists remained in the experimental group and 64 in the control group. Intra-oral and extra-oral examinations, 2 eight-page bulletins, pre-test results for each dentist, conference call with other dentists were used to measure the behavior of dentists towards patients with HIV/AIDS. The loss to follow-up was 3/102 dentists (2.8%).

Table IV: Dentists' competency in oral examination following an intervention

Review:
Behavioural interventions for reducing HIV risk or infection in employees in occupational settings

Comparison:
04 Educational intervention vs Control

Outcome:
01 Oral examination



The outcome of interest was knowledge, attitudes and behavior with respect to HIV/AIDS. Table IV indicates that dentists in the control group were better in doing oral examinations than those who were exposed to an educational intervention, with a relative risk of 3.67 and the confidence interval of 0.34 to 39.06. The range in this study is very wide but the finding was not statistically significant ($p = 0.28$).

Ghys et al. [12] conducted a study on the effect of interventions to control STDs on the incidence of HIV infection in female sex workers in Abidjan. Women were asked to keep a sexual

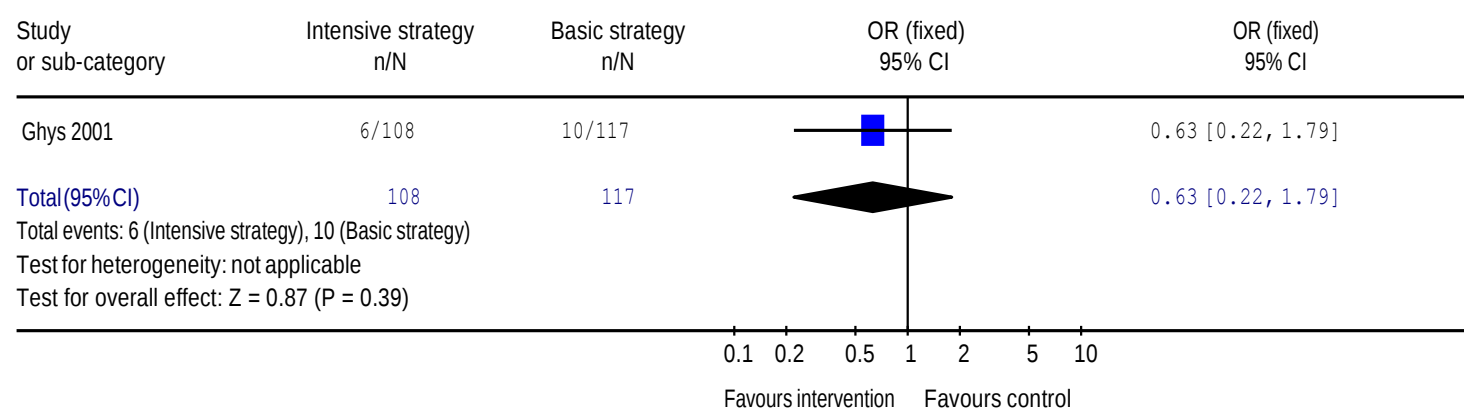
activity log to record number of sexual acts with or without condom per day. Participants in this intervention were 1,370 female sex workers visiting an AIDS clinic in Abidjan. 542 enrolled were in the study. Consenting participants were interviewed, clinically examined, screened and treated for STD and HIV, and counseled. FSWs who were HIV negative or HIV-2 sero-positive were invited at the time of post-test counseling to participate in the intervention study. Following informed consent, women were randomized to either an intensive or basic STD screening and treatment strategy.

Table V: HIV-1 sero-prevalence in FSWs following an intensive strategy

Review:
Behavioural interventions for reducing HIV risk or infection in employees in occupational settings

Comparison:
05 Intensive strategy vs Basic strategy

Outcome:
01 HIV-1 seroincidence



The outcomes of interest in this intervention were condom use and HIV incidence. About 165/273 participants in the intensive strategy (60.4%) were lost to follow-up. Table V indicates that the HIV-1 sero-incidence was lower in female sex workers in the intensive strategy than those in the basic strategy with an odds ratio of 0.63 and a confidence interval of 0.22 to 1.79. The difference was not statistically significant ($p = 0.39$).

Kelly et al. [13] conducted a behavioral intervention to reduce AIDS risk activities among office employees in Mississippi, USA. Participants in this intervention were 104 male employees

visiting gay bars and health clinics. The experimental group ($n=51$) and control group ($n=53$) were randomly assigned after the assessments.

Researchers distributed materials describing the study to patrons of gay bars and at health department clinics. All subjects completed a set of self-report, behavioral and self-monitoring measures. The Risk History Survey was used to assess behaviors such as anal and oral intercourse, intercourse sessions in which condoms were used, digital/anal activities and anal/oral contact as either the insertive or receptive partner.

Risk behavior self-monitoring was completed over a 4-week baseline period. Self-report inventories were administered to assess depression, anxiety and attributions concerning internal versus external factors that influence general health. After the intervention, all subjects from both groups were individually

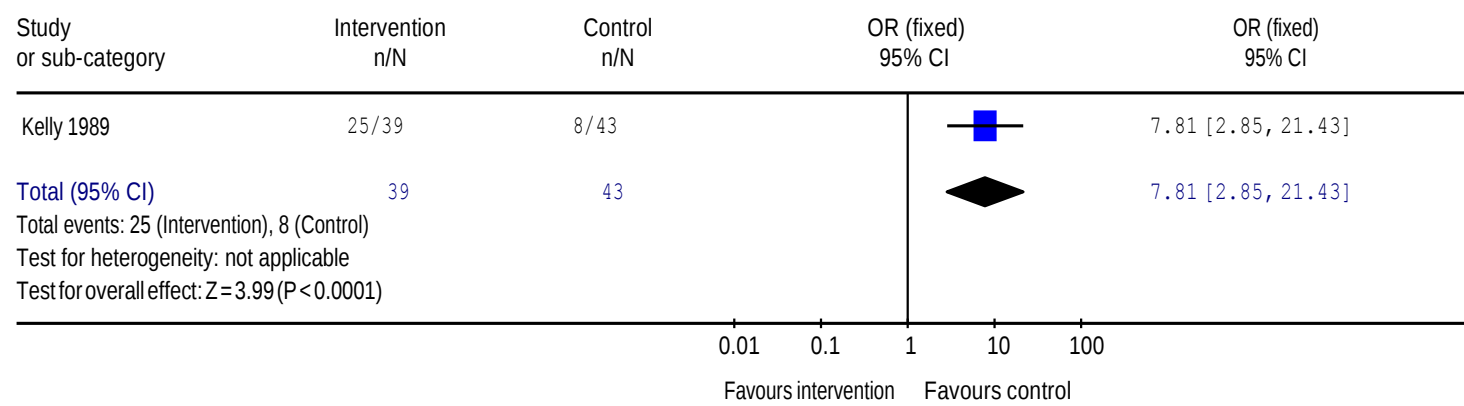
reassessed to determine the change associated with participation in the intervention. Control groups were offered the intervention immediately after post-training assessments. 12/51 in intervention (23.5%) and 10/53 in controls (18.9%) were lost to follow-up.

Table VI: Condom use in employees after a behavioural intervention

Review:
Behavioural interventions for reducing HIV risk or infection in employees in occupational settings

Comparison:
06 Condom use vsnon-use

Outcome:
01 Condom use



The outcomes of interest in this intervention were the number of sexual partners over 4 months and the frequency of unprotected sex and condom use. Table VI indicates that condom use was higher in office employees who were in the control group than those in the intervention group who received risk reduction interventions, with an odds ratio of 7.81 and the confidence interval of 2.85 to 21.43. This difference in condom use between the two groups was very large and was statistically significant with $p < 0.0001$.

Peterman et al. [14] analyzed data from Project RESPECT, a large behavioral intervention that enrolled heterosexuals attending large public STD clinics in 5 US cities. The aim of this intervention was to determine whether measured behavior

reflect STD risk. About 4,328 HIV-negative heterosexuals were randomized to intervention groups.

Participants were randomized to 4 arms: 3 different counseling interventions were tested and all interventions were completed within 4 weeks of enrolment. 3 of the study arms had interviews at baseline, 3, 6, 9 and 12 months and STD exams at baseline, 6 and 12 months. Participants either received didactic messages, brief counseling or enhanced counseling sessions at different intervals or were interviewed at 3, 6, 9 and 12 months. About 1981/4328 (45.8%) of participants in intervention group were lost to follow-up. The outcomes of interest in this intervention were condom use and frequency of unprotected sex.

Table VII: Unprotected sex with main or occasional partners

Review:
Behavioural interventions for reducing HIV risk or infection in employees in occupational settings

Comparison:
08 Unprotected sex vs protected sex

Outcome:
01 Unprotected sex

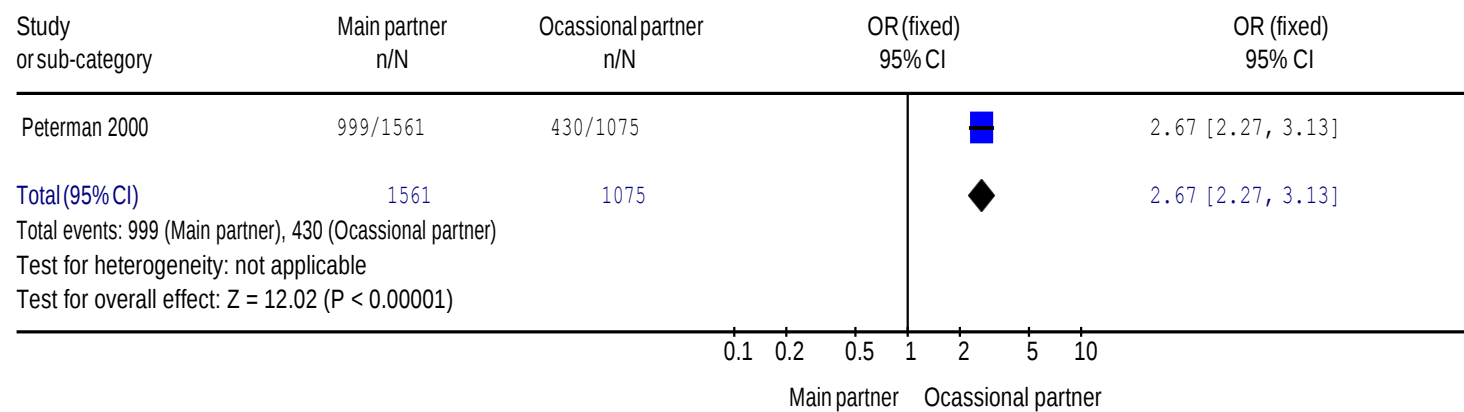


Table VII indicates that heterosexual office employees are three times more likely to have unprotected sex with an occasional partner than with their main partners, with an odds ratio of 2.67 and a confidence interval of 2.27 to 3.13. The difference in unprotected sex between the two groups was statistically significant with $p < 0.00001$.

Valdiserri et al. [15] conducted a randomized field experiment trial evaluating two risk reduction interventions in which participants were 584 homosexual and bisexual male office

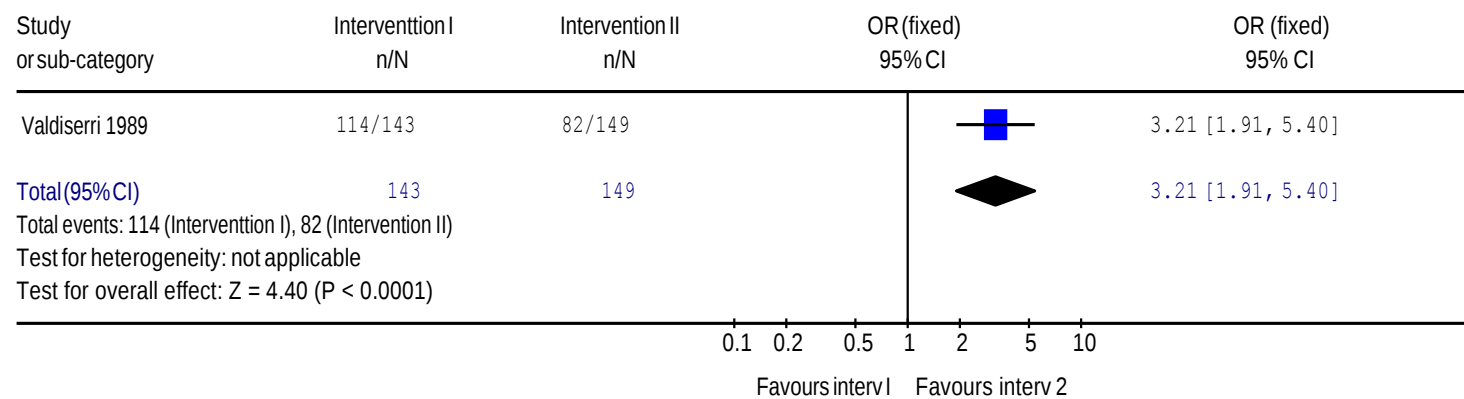
employees at a community-based organization in Pittsburgh, USA. There were two intervention sessions where 265 individuals were in were in intervention group 1 and 319 individuals were in intervention group 2. The aim of the study was to determine the effects of an educational intervention on sexual risk and protective behaviors. Intervention group 1 was a small group lecture only and intervention group 2 was a small group lecture and skills training.

Table VIII: Condom use in male office employees following risk reduction interventions

Review:
Behavioural interventions for reducing HIV risk or infection in employees in occupational settings

Comparison:
10 Condom use

Outcome:
01 Condom use in Intervention I vs Intervention II



The outcomes of interest in this trial were the number of sexual partners and frequency of condom use. Table VIII indicates that male office employees who received a small group lecture and skills training (intervention group 2), were three times more likely to use condoms than those who received a small group lecture only, with an odds ratio of 3.21 and a confidence interval of 1.91 to 5.40. This difference was statistically significant at $p < 0.0001$.

Weir et al. [16] reported on a randomized controlled trial in 2,269 female sex workers in Yaounde, Cameroon. Participants were randomized to one of 5 different questionnaires on condom use; the first three questionnaires used always to never scales to measure use; the fourth questionnaire asked about condom use in the last 10 coital acts; and the fifth questionnaire was a retrospective log of coital acts in the last 2 weeks. Measuring condom use: asking "do you or don't you" isn't enough. The outcome of interest in this trial was self-reported condom use.

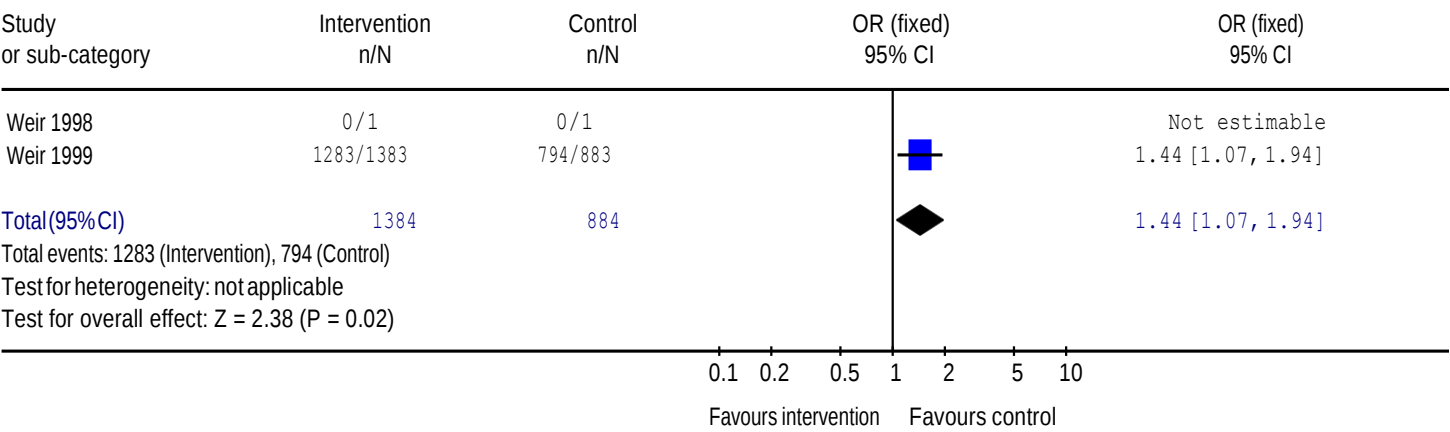
Weir et al. [17] conducted a randomized trial to measure association between condom use and HIV infection. Participants in this intervention were 2,266 female sex workers in Yaounde, Cameroon. Each woman was randomized to receive one of five different questionnaires on condom use. Random assignment was done in block sizes of 10 to assure equal assignment to each group throughout the study and was done independently within each of the three clinics where women were screened. Participants were divided according to the following questionnaire group: Current (460), past month (464), Past 6 months (459), Last 10 acts (442) and Coital log (441). The randomization was designed to select 5 groups of approximately equal size with similar levels of condom use and exposure to HIV. Allocation concealment was adequate as computer-generated labels identifying the questionnaire to be used were printed and sealed in envelopes at Family Health International (FHI) and sequentially distributed to interviewers when needed to complete the supplemental condom questionnaire. There was blinding of participants.

Table IX: Condom use in female sex workers after an intervention

Review:
Behavioural interventions for reducing HIV risk or infection in employees in occupational settings

Comparison:
12 Condom use vs prevalence of HIV

Outcome:
01 Condom use



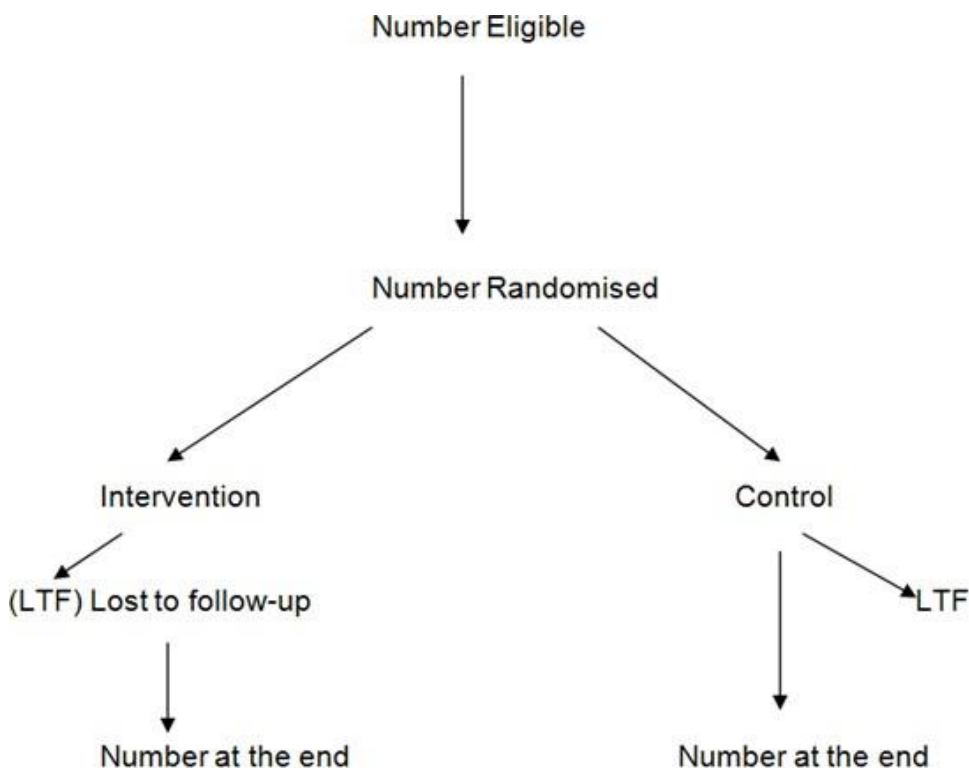
The outcome in this study was self-reported condom use. Table IX indicates that condoms were used more with the last client (45.5%) than with last non-client (19.4%). None of the five

level measures of condom use showed clear dose response protective effects for condom use.

Zagumny and Deckbar [18] conducted a randomized trial in 120 undergraduate students at a university in Tennessee. There were 30 participants per group and all participants were white and between ages 18 and 56 years. Participants viewed one of 3 videos and read one of 4 scenarios about training a new

employee. The 3 videotapes, including the control tape, were employed to increase their concern or information about AIDS. The main outcomes of the study were perceived risk of infection and willingness to work with an HIV positive co-worker.

Figure I: Flow chart of the randomisation process



Quality of included trials

The methodological quality of each study was calculated to indicate whether randomization was A (adequate), B (inadequate) or C (unclear). The results on each table show whether the findings favor the intervention or control/comparison group.

Six of the thirteen studies were rated A for methodological quality in terms of the Jadad et al. [19] scale. This implies that these trials were truly random, allocation concealment was adequate and the trials were blinded. The trials that were rated A were Eggers et al. [9], Gerbert et al. [11], Machekano et al.

[8], Valdiserri et al. [15], Weir et al. 17 and Zagumny et al. [18]. These trials were classified as having low risk bias because they met all the criteria.

The methodological quality of four studies was rated B because the randomization was partially done, allocation concealment was either inadequate or not properly explained and blinding was unclear or not explained. The studies that were rated in this category included Ghys et al. [12], Katzenstein et al. [7], Kelly et al. [13] and Peterman et al. [14]. These trials were classified as moderate risk of bias because one or more criteria were partially met.

Three studies were rated C because randomization was either partially done, or allocation concealment was inadequate or not properly explained or blinding was not done. The studies that were rated in this category included Bassett [6], Gallop et al. [10] and Weir et al. [16]. These trials were classified as high risk of bias because one or more criteria were not met.

Characteristics of excluded studies

Two hundred and ninety two (292) studies were identified as including employees in occupational settings in their samples. Of these, 181 studies were excluded from our sample due to not meeting our methodological criteria for study design, inadequate analysis reported or multiple published reports from one study sample.

About 171 (94.5%) studies were excluded because they were not interventions or were either qualitative studies, case studies, news articles, reports, policy documents, conference reports, book chapters, letters to the editors or any non-quantitative HIV/AIDS research document that did not meet inclusion criteria. Ten studies (5.5%) were excluded because they were published in a language other than English.

Discussion

The results obtained in this review indicate that behavioral focus of the most effective interventions was:

Promotion of safer sex through condom distribution and condom use

The use of peer education to encourage other employees to transmit HIV/AIDS prevention messages to their colleagues.

Using Behavior Change Communications (BCC) which is referred to as Information, Education and Communications (IEC) in most of the studies.

The use of Voluntary Counseling and Testing (VCT) to help workers know their HIV status

The provision of Information, Education and Communications (IEC) material and condom distribution were found to be effective in reducing HIV risk among workers. This is an interesting finding as these interventions are easier to implement at many workplaces. The provision of IEC material demands an answer on whether the provision of knowledge causes a change in behavior especially among workers, where literacy levels vary dramatically. Condom distribution does not also imply that they will be used but many interventions used both components with the hope that availability and education on condom use will reinforce the need for behavior change.

The behavioral outcomes of effective interventions were condom use, reducing the number of sex partners, improved care for Sexually Transmitted Infections (STI's) and HIV and increasing Knowledge, Attitudes, Behaviors And Practices (KAPB's) with respect to HIV/AIDS.

Several aspects of sexual behavior are understood to be associated with the risk for HIV transmission. The three most commonly reported sexual behavior outcomes were unprotected sex, condom use and number of sex partners. Unprotected sex was defined as including vaginal or anal sex without a condom. The selection of appropriate outcome measures in studies of the effectiveness of behavioral interventions for reducing HIV/AIDS, depends on a number of factors: the research question(s) that the study is designed to answer, the availability of behavioral assessments with good psychometric properties that are also culturally and gender appropriate; whether sufficient members of the at-risk population can be recruited and maintained in a longitudinal study in order to establish statistically significant differences (i.e. power issues); available financial resources to support the research effort [20].

Although, Randomized Controlled Trials (RCTs) are seen as a "gold standard" and are recommended as the primary strategy for assessment of effectiveness of different interventions, including behavioral interventions, they are however, very rare especially in behavioral interventions, which are more often conducted by social and behavioral scientists who are more inclined towards qualitative research approaches. There are

practical and political difficulties with RCTs because they require substantial investment of time, expertise and funding. These factors have probably contributed to the generally low quality of evaluation research in HIV/AIDS prevention [9].

One of the limitations of the study was that although the effect of the study design on systematic bias has been examined, it was difficult to examine the effect of sample size. Again, a number of the studies examined did not reach statistical significance. It is not clear whether this is a result of poor sample size or whether the effect of the intervention was non significant. Reviewers who continue research in this area of study should address this issue.

Conclusions

A number of HIV prevention interventions that reduce HIV risk or infection among employees in occupational settings have been shown to be effective. These interventions include one-to-one counseling, small-group skills building sessions based on sound principles of behavioral science, workplace-based interventions that recruit workers to act as behavior change agents, and outreach programmes using employees in the workplace. Interventions that employ peer leaders to endorse change produce or accelerate population behavior changes to lessen risk for HIV infection.

Innovative and sustained workplace-based interventions are needed to address the high risk of HIV infection. Interventions to prevent HIV transmission among workers must be tailored to local environment and in particular, to the socio-economic status and cultural needs of the workers. Health education is needed to reduce the risk of HIV infection and should emphasise the socio-cultural differences in sexual practices.

There is a need for public health efforts to address the behavioral factors that place workers at risk of HIV in the course of their work. Workplace HIV/AIDS policies have an influence on the type of interventions that could be offered to deal with behavioral risk among workers. Some studies have shown that companies that have workplace HIV/AIDS policies

are able to develop reasonable interventions for dealing with HIV in the world of work.

Risky sexual behaviors are the primary routes of HIV transmission. As a result, most prevention interventions work by modifying HIV-related risk behaviors. Further research should refine the existing specifications of the functional relationships between HIV-related risk behaviors and biological outcomes and to determine, where possible, not only whether a particular intervention works, but why.

Again, efforts should be made to study the manner in which program managers and policy makers use various outcome measures in their decision-making about HIV prevention programmes, and their information needs should be considered in outcome measure selection.

Evaluation design in behavioral research needs to be improved. We recommend more use of randomized controlled trials for behavioral interventions.

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