

# Systematic Review of Behavioural Interventions Targeting Men to Prevent Heterosexual Transmission of HIV in Developing Countries

Ibrahim Audu Salisu\*, Chima E Onuekwe, Collins Owili

World Health Emergency Programmes, North-east Nigeria, Nigeria

## ABSTRACT

**Background:** People in developing countries and especially sub-Saharan Africa bear a huge brunt of HIV/AIDS pandemic. Transmission in adults is mostly heterosexual with men playing a key role in such dynamics. They do so because of risky sexual practices and behaviours which are shaped by cultural norms. Behavioural interventions are likely to reduce such transmissions. The primary objective of this study is to examine the evidence of the effectiveness of behavioural interventions targeting men to prevent heterosexual transmission of HIV in developing countries.

**Method:** We conducted a systematic review of studies evaluating the effect of behavioural interventions in developing countries published from 1990 to 2011. Five databases were searched; Pub Med, MEDLINE, Cochrane, Trip database, Eldis, Africa Health line, CINAHL and AIDSLINE. Contact has been made to SFH (Nigeria) and International AIDS Alliance at Brighton, UK and USAID (Nigeria). Data were extracted and qualitative thematic-synthesis was done to pool evidence, which was presented in a narrative format.

**Results:** Some 6339 articles yielded from the search. 501 titles of abstracts were reviewed, 82 studies were thoroughly examined and 22 met the inclusion criteria. All studies that met the inclusion criteria were critically appraised and reviewed. Only 5 RCT was found, reflecting the paucity of published rigorous studies in comparison to HIV/AIDS burden in this region. Other non-randomized evaluation studies were included in the analysis. Multi-component interventions produced more positive changes in behavioural outcomes. Interventions with short delivery time, targeting experienced men in workplaces were associated with more positive changes. Behavioural outcomes like knowledge of men about HIV, condom use, attitude towards condom, gender roles/GBV are easier to change than reduction in number of sexual partners/episodes of unprotected sex with CSW/other partners. Very few studies evaluated interventions impact on biological outcomes though also reported positive changes. Only limited evidence exists to show that interventions in which men participated in the evaluation process are more effective.

**Conclusion:** Although the evidence base is narrow, behavioural interventions can prevent heterosexual transmission of HIV by men in developing countries. Only a few rigorous studies evaluated intervention impacts on behavioural outcomes, though reported positive impacts. Policymakers and programmers should consider contextual factors in designing new interventions. Researchers should employ more rigorous methods in evaluating interventions to expand the existing body of evidence.

**Keywords:** HIV; Developing countries; Behavioural interventions

**Correspondence to:** Ibrahim Audu Salisu, World Health Emergency Programmes, North-east Nigeria, Nigeria, Tel: +234 9062740637; E-mail: salisui@who.int

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## INTRODUCTION

HIV/AIDS is a major cause of morbidity and mortality among adults and children worldwide. By the end of 2000, about 90 percent and 75 percent of the world's 36.1 million people living with HIV were living in developing countries and sub-Saharan Africa respectively [1]. HIV/AIDS prevention programs in developing countries are likely to be more effective if men are targeted [2]. This is particularly so in this setting where heterosexual men are important in HIV transmission as they constitute a major part of the problem and can at the same time be an essential part of the solution [2]. Although the percentage of men participating in HIV prevention interventions has typically been lower than that of women, traditional male gender roles emphasize sexual risk-taking in the context of heterosexual transmission of HIV in sub-Saharan Africa [2].

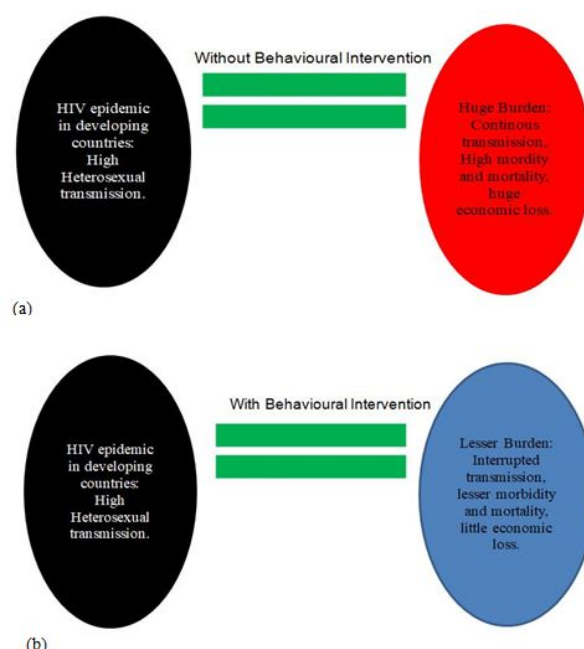
Throughout the course of HIV/AIDS epidemics, experts working to reduce the number of new infections has increasingly recognized the role of gender and other power relations as well as inequalities and disempowerment in the transmission of the disease [3]. It has been extensively documented that women worldwide, especially in developing countries, are less likely as men to be able to control when, where and how sex takes place, and Men's roles and responsibilities have a significant bearing on the health of their female partners and other family members [3]. The recognition of this trend is reflected in such international collaboration to engage men in HIV prevention as the UNAIDS World AIDS campaign 'Men make a difference' [4].

Men are influenced by cultural norms regarding manhood, some of which are very negative in the context of HIV [5]. Cultural, social and economic factors in most developing countries dictate that men are in a stronger position in relationships and give them more control in deciding where to have sex and whether or not to use a condom. Negatively constructed images of masculinity can encourage high-risk behaviors such as violence, sexual prowess and risk-taking (for example, having multiple female partners), and excessive alcohol use [5]. These 'macho' attitudes are encouraged in many cultures and put women in a vulnerable position to acquire HIV infection [5]. This is connected to imbalances in decision-making power which means that women cannot negotiate condom use and may often be forced to have sexual relations.

Men are traditionally seen as providers and so believe that they must fulfill this role. Many of them react negatively if they cannot find work or they are unable to provide for their family. The sense of anger or disempowerment may lead to alcohol or drug abuse, or violent behaviour, increasing their own and their partner's risk of HIV infection [6]. Employment opportunities for men may restore self-esteem and reduce their tendency to engage in very risky behaviours. However, employment may also mean that couples have to stay apart since men must sometimes migrate or be mobile for work, as is the case for long-distance truck drivers [6]. Because of loneliness and availability of money, some may resort to having unprotected sex with Female Sex Workers (FSW) and eventually become HIV infected. Once infected, these HIV positive men, in turn, infect their wives and other sexual partners [6]. And although men's risky behaviours

and gender norms transmission play significant roles in HIV transmission and young people account for a high proportion of all new infections in most developing settings, HIV-positive young women can out-number their seropositive male peers by as much as six times [6].

Because the vast majority of newly acquired adult HIV infection in Sub-Saharan Africa and other low-income countries is through unprotected intercourse (including paid sex) [7], behavioural interventions are seen as promising prevention strategies. For example, in Zimbabwe population-wide changes in sexual behaviour have over the years resulted in a decline in incidence and prevalence of HIV [8]. Behavioural HIV prevention activities offer opportunities for HIV reduction through wider institutional, socio-economic, legal and political dimensions: Reducing violence against women to improve stability of families; encourage communication about HIV and condom use to adopt the safer sexual practice, encourage female education and gender-equitable norms to empower women to negotiate sex [8].



**Figure 1:** (a): Schema of the impact of HIV Transmission without behavioural intervention; (b): Schema of the impact of HIV transmission with behavioural intervention.

Majority HIV prevention programmes focus on prevention of Mother-To-Child Transmission (MTCT), Antiretroviral Therapy (ART) for people living with HIV (PLWHA) and prevention activities targeting high-risk (Core) groups such as Commercial Sex Workers (CSW), Injection Drug Users (IDUs) and other Sexually Transmitted Disease (STD) patients. Only a modest effort was made to unchain the link between the core groups (CSW) and the general population through behavioural interventions targeting at-risk men. Although there is lack of enough evidence of the effectiveness of current heterosexual prevention strategies, efforts to do so will not only generate evidence to guide policymaking but will also help to determine the most appropriate intervention(s) and detect bias in individual evaluation studies [9]. And while this systematic

review aims to fill this critical gap, it is important to note also that in a situation where literature base is small or narrow, a systematic review may under-power evidence from primary studies and exclude intervention effects where some truly exist [9].

The simple conceptual model below provides a framework to understand the potential effects of behavioral intervention on the dynamics of heterosexual transmission of HIV. This is presented in Figure 1a and 1b above.

## AIM AND OBJECTIVES

### Aim

To examine the evidence for the effectiveness of behavioural interventions targeting men to prevent heterosexual means of transmission of HIV in developing countries.

### Objectives

- To identify studies evaluating the effectiveness of behavioral interventions targeting men to prevent heterosexual transmission of HIV in Africa
- To critically appraise the identified studies in terms of evidence for effectiveness in preventing heterosexual transmission of HIV
- To identify features of interventions associated with effectiveness
- To identify challenges and gaps in current practice and make recommendations for future interventions

**Table 1:** Definitions of PICO elements.

P: Population	Men in Community, truck drivers, military base, beer halls, etc.
I: Intervention	Community prevention, Behavior change campaigns, Information and Education Campaigns (IEC), social marketing, school/peer education, etc.
C: Comparison	The control group (Men) in the study who do not receive the intervention of interest.
O: Outcome	HIV, Sexually Transmitted Infections, Condom use, Mutual monogamy, Sexual debut, Abstinence, Sexual partnership, Gender-based Violence, safer sexual behavior, etc.

The Study designs include 'Randomized controlled trials quasi RCTs, cluster RCTs and non-randomized evaluation studies like a cohort, cross-sectional and Quasi-experimental and other pre- and post-test designs and systematic review of interventions.

The search terms were combined using the Boolean operator 'AND' and 'OR' and a further search conducted using the databases and relevant articles were selected. These combined terms have been selected on the basis of the most appropriate groupings for this specific project. The combinations have reduced the results of the search to a manageable number.

The literature search was conducted iteratively, and the search strategy reviewed and refined as the study progressed. This produced both a sufficient and manageable number of relevant articles. The sensitivity and specificity of the combinations of

## METHODOLOGY

### Search strategy

A systematic search was conducted to identify the relevant articles for this review. First, the search was undertaken for published articles in electronic databases including Pub Med, Cochrane, Medline, and Trip database, Eldis, African Healthline, CINAHL and AIDSLINE. A list of key search terms was used to locate the relevant articles. These were free terms, MeSH terms and a combination of both. Further guidance and advice were sought from LSHTM library staff on how to develop a good search strategy and use of search terms and on how to make a productive combination of the search terms.

The search terms include 'Evaluation', 'Randomized controlled trials', 'interventions', 'cohort studies', 'cross-sectional studies', 'Systematic Reviews', 'Men', 'Gender', 'Community prevention', 'Behavior change campaigns', 'Information and Education campaigns', 'Condom use', 'Sexual debut', 'HIV', 'STI', 'Concurrent partnership', 'Sexual partnership', 'Abstinence', 'Gender-based violence'. The synonyms or equivalent terms for some search terms (like age at first intercourse for sexual debut and faithfulness, concurrent partnership for mutual monogamy) and differences in the spellings of the search terms/concepts have been gathered and used as part of the search strategy.

The PICO exercise and the study design have been used to locate and select primary studies for eligibility [10]. The search was thorough so as not to miss any key evidence. For PICO, the description is shown in Table 1 below:

the search terms were assessed in relation to the article yields, and the strategy was further refined.

Second, the reference list of the retrieved articles was searched for other relevant articles. In a bid to discover grey literature, electronic contact (via email and telephone) was made to staff at Society for Family Health (SFH), Nigeria, and International AIDS Alliance in Hove, Sussex, UK and the United States Agency for International Development (USAID), Nigeria. I have also made a personal visit to Society for Family Health was made and useful materials were gratefully provided.

### Inclusion and exclusion criteria

The selection of primary study for inclusion is based on the requirement of the review aim and the relevance of the study concept.

**Inclusion criteria:** Primary studies are eligible for inclusion if they meet the inclusion criteria based on the study population, study design, types of intervention and outcomes. Eligible for inclusion in the analysis are; (a) studies evaluating interventions targeting men only, with age ranging between 13-79 years, (b) studies with evaluation design such as Randomized Controlled Trials (RCTs), Quasi-experimental designs, Pre-/post-test designs, Longitudinal studies, and Cohort studies. Also, to be included are high-quality cross-sectional studies and qualitative designs, (c) studies with interventions and behavioural only (or in combination with other) outcomes measured at baseline and at follow-up, (d) studies conducted in developing countries, (e) studies published in English between 1990-2011.

**Exclusion criteria:** Studies with different designs or similar designs but targeted Men who have sex with men (MSW), Men-and-women, Female Sex Workers (FSW) or other women, boys less than 13 years old or have outcomes other than behavioural are excluded. Excluded also are studies conducted in developed countries, published in languages other than English, and those on which no adequate information is available or full texts have not been found.

1. For the purpose of the project, Men are defined as men (single, married or divorced) and boys between 13-79 years.

2. Developing countries are low-and middle-income countries with Gross National Income (GNI) of less than \$12,195 (World Bank, 2009).

### Quality assessment of primary studies

The qualities of primary studies are judged with the aid of a quality assessment instrument (See Appendices Table 2a and 2b). The methodology of the primary study is particularly important because the quality of the literature review is majorly dependent on the quality of the primary studies it encompasses [7]. The primary studies include RCTs, including cluster RCTs, quasi-experimental and other evaluation designs such as pre-/post-test studies, cohort studies, cross-sectional studies and Systematic review of interventions but greater weightings are given to RCTs. The sample size, response rate, level of randomization, loss to follow-up and level of analysis are checked as well as the pattern of the interpretation of results and effect size. The strategies used to minimize bias/errors are considered. Poorly conducted studies may have a bigger effect size [7]. The qualities of qualitative studies are assessed by critically examining the phenomenon being studied, the context (theoretical framework, setting, and sample), data collection methods, analysis and potential researcher bias [8].

### Data extraction

Data extraction involved taking information from studies that are relevant to answering the review question [7]. Data extraction in this review is complicated by heterogeneity in study designs; RCTs, non-randomized experimental studies, cohort studies, cross-sectional studies, etc., interventions; Community prevention, IEC, peer-/school-based education and outcomes. I used a prepared data extraction tool (See Appendices Table 2a and 2b) to extract data from different studies. Measures have

been taken to reduce bias in data extraction such as extracting information from the same study more than once and standardized format of data extraction has been followed. However, indicators/measures have been manipulated where necessary. Relevant information about the study population-Men, an estimate of the effect, for example, the extent of condom use, and information on potential sources of bias/errors from primary studies have been collected.

A clear summary of the literature reviewed is provided in a table format. This offers the opportunity to compare and contrast findings from different studies and explain or hypothesize why such differences occur.

### Ethical consideration

Ethical approval is not required for this project. The project is a systematic review involving no human subject or unpublished data and so involve no human risk or other ethical concerns.

### RESULTS

A total of 6107 articles were yielded by the 'hits' of the combination of search terms from different databases and 232 from the organizations. This makes a total of 6339 from all searched sources. After reading through the titles, 501 studies were on related to the HIV epidemic. These articles were further examined for eligibility. 208 articles were excluded because of irrelevant intervention/outcome, 71 articles targeted MSM, FSW, women or IDUs and 35 were conducted in developed countries. Of the remaining 102 articles, 11 had participants with boys less than 13 years and 9 were excluded because no full text was available/no response from authors and 60 articles were further excluded because interventions targeted men and women together. A total of 22 met all the inclusion criteria and have been reviewed and included in this project, involving 18594 participants.

Eleven studies evaluated the intervention in Africa- 4 in South Africa, 2 in Nigeria and 1 each in Kenya, Zimbabwe, Angola, Uganda, and Mozambique. Eleven studies also evaluated interventions in other developing countries outside Africa 5 in India, 2 in the Philippines, 1 each in Hong Kong (China), Brazil, Jamaica, and Pakistan.

The behavioural interventions vary considerably in terms of design, content, and duration and also targeted men with different socio-economic background and in different settings. The effects of such interventions are not expected to be homogenous across the varying categories. This requires that the interventions be critically examined according to their ability to produce positive outcomes or otherwise.

Although 22 articles were included in the analysis, attention is focused most on 5 studies with the most rigorous methodologies (Randomized controlled trials [11-14] and Randomized community level-controlled trial [15]. See Appendices Table 2a and 2b. These studies evaluated intervention impacts on men to change the attitude towards condom and/or gender role/GBV [12], reduce HIV risk behaviour [11-15] or improve condom use [12,14,15] and improve knowledge of HIV/AIDS [11]. Kajupi P et al. [15] evaluated the impact of 3 months of practice and



demonstration of condom use and addressing barriers on 498 men, aged 18-30 in peri-urban communities in Uganda. Bing EG et al. [11] evaluated the impact of 5 days of HIV prevention and control program, based on the IMB skill model on 568 Soldiers who were 18 years or greater in Angola. Lau JT et al. [14] targeted 301, 18-60-year-old truck drivers in Hong Kong with VCT services, educational pamphlets over 9 weeks. Cornman DH et al. [12] evaluated the impact of 9, 4-hour long IMB skill workshop on 250, 20-78-year-old truck drivers in Chennai, India while Fritz K et al. [13] targeted 1217 men, 28-34-year-old in beer halls in Zimbabwe with 15 months of peer-based education based on IMB skills theory.

### Intervention type

Thirteen interventions were evaluated in the studies with the most rigorous methodologies- RCTs [11-15] and high-quality non-randomized evaluation studies [16-23]. The extents of the improvement in the behavioural outcomes reflect the degree of effectiveness of the intervention and as expected, the impact of the interventions is not homogenous. Nine interventions [11,12,16,17,20,22-24] reported significant beneficial effects on behavioural outcomes. Two interventions did not [13,19]. Two other interventions produced mixed effects [15,18]. Bing EG et al. [11] delivered HIV prevention and control intervention based on Information, motivation and behaviour skills model, Lau JP et al. [14] delivered VCT services, Post-test counselling, distributed educational pamphlets and letters and Cornman DH et al. [12], delivered Information, Motivation and behaviour skills workshop and condom distribution interventions in Angola, Hong Kong and India respectively and reported significant positive effects. Lipovsek V et al. [20] reported that men exposed to multi-channel interventions reported higher consistent condom use than those exposed to one or none. Fritz K et al. [13] evaluated peer-based multi-component intervention based on IMB skills behaviour change model, including the use of pamphlets, posters and condom supplies, which targeted men in beer halls. No significant positive effect on behavioural outcome was reported. In Kalichman SC et al [19], sexual communication was promoted to reduce GBV and resulted in no significant effect. Kajubi P et al. [15] evaluated single-type intervention and Jackson DJ et al [18] evaluated multi-component intervention in Uganda and Kenya respectively but reported mixed results.

### Duration of intervention/level of exposure

In terms of duration of interventions, significantly more positive effects on behavioural outcomes were reported in studies (RCTs) with short delivery time of interventions [11,12,14]. Studies (RCTs) with long intervention-delivery time<sup>4</sup> reported lesser or no positive impact on outcomes [13,15]. Kajubi P et al. [15], having 3 months intervention period reported positive intervention impact on condom uptake but no impact on the number of sexual partners. The trend is reversed in non-randomized evaluation studies. One study with short intervention time reported no significant impact, but three studies with longer intervention time reported a significant intervention effect. The levels of exposure vary across studies. In Kajubi P et al. [15], men attended 8 sessions of intervention over

3 months. In Bing EG et al. [11], men attended 5 sessions in 5 days and in Cornman DH et al. [12], they attended 9 sessions of interventions. Fritz K et al. [13] and Lau JT et al. [14] did not state the number of sessions of interventions attended. No study reported on-trend in behavioural changes associated with serial follow-up in the long term.

1. Short Intervention-delivery time is defined as intervention conducted in less than 3 months

2. Long Intervention-delivery time is defined as intervention conducted in 3 months or more

### Characteristics of participants

With respect to the characteristics of participants, the significantly more positive impact was produced by interventions targeting older men [12,14,16,24] than interventions targeting younger 5 men [11,15]. Interventions that produced no positive effects targeted only young men (all below 35 years) [13,15,19]. In addition to the age, all included articles mentioned explicitly that the interventions targeted men only. At the study level, intervention effects were more positive in men targeted at workplace/working together [11,12,14] than men in the community [13,15,18,19]. Those interventions with less or no positive effects targeted men at the community-level [13,15,18,19]. More favorable results of intervention impact were reported in studies targeting middle-class men [11,23]. Less favourable results were reported by men of low or unspecified social class [15,18].

1. Younger age groups are a group of men with all members less than 40 years

2. Older age groups are groups of men with some members for more than 40 years

### Intervention process

Studies evaluating interventions in which men participated in the design/implementation mostly produced positive outcomes [11,13,15,20,21]. However, Fritz K et al. [13], a peer-based intervention, reported no positive intervention effect. Two other studies reporting positive intervention impact did not engage men in the design or implementation [12,14]. Except in Bing EG et al. [11] in which other stakeholders like the leadership Angolan Armed forces expressed concerns about the rate of HIV and were involved in the design and implementation of the intervention, the other interventions did not involve external stakeholders. Bing EG et al. [11], Lau JT et al. [14] and Fritz K et al. [13] gave feedback to the participants on the results and their performance. No other community/opinion leaders or NGOs was involved in implementing interventions.

### Outcome

The outcome of all the studies included in this review is grouped either as behavioural or biological outcomes. Most studies evaluated intervention impact on behavioural outcomes (Changes in knowledge, changes in attitude or changes in risk behaviour) with only a few reporting biological outcomes. The behavioural outcomes are however subject to reporting and

measurement bias. Biological outcomes, however, provide stronger evidence and the measurement of which relies on the objective rather than subjective methods.

**Changes in attitude:** The effect of the intervention on the attitude of men toward condom, GBV was evaluated in six studies [19,21,23,25-27]. Only Kalichman SC et al. [19] reported no intervention impact on gender roles and GBV.

**Changes in knowledge:** Six studies evaluated intervention impact on knowledge of men about HIV/AIDS/STI [11,22,25,28-30]. All intervention had a significant impact on the knowledge of HIV/AIDS.

**Changes in biological indicators:** Two studies evaluated biological outcomes [17,18]. Jackson DJ et al. [18] reported a decrease in the incidence of STI and Bentley ME et al. [17] reported a decrease in HIV incidence in the intervention groups.

**Changes in risk behaviour:** The dimensions of risk behaviour vary from the number of sexual partners; episodes of unprotected sex and condom use with CSW or other partners. Ten studies evaluated interventions effects on the number of sexual partners/episodes of unprotected sex with CSW. Six [12,14,17,18,23,24] studies reported positive intervention effect while four studies [13,15,19,30] reported no impact on this outcome. All but one study [18] evaluating the intervention effect on condom use reported a significant impact.

## Evaluation methodology

Different methodological approaches were employed in evaluating the impact of the interventions. Within the RCTs sub-group, there was an adequate level of randomization, and blinding was equally reported. Primary or secondary outcomes of interest that were measured at the baseline were also measured at follow-up. The most significant variation in the methods is their respective sample sizes. Four of the RCTs reported either significant or some intervention impact on outcomes [11,12,14,15]. The only one reported the unfavourable result. Methods using larger sample sizes reported mixed results [11,13,15] (two reporting positive results and one reporting negative) while those with smaller sample sizes reported favourable results [12,14]. A clear pattern of intervention effectiveness associated with sample size cannot be ascertained.

## DISCUSSION

This review is a systematic attempt to identify, retrieve, critically appraise and synthesize evidence of all behavioural interventions undertaken in developing Countries to positively change men's behaviour in the context of heterosexual transmission of HIV. Database search for relevant articles yielded very few randomized controlled studies. This demonstrated the paucity of published studies evaluating behavioural interventions targeting only men, which can be pooled to produce the substantial and rigorous body of evidence of effectiveness in the developing world, where the greater burden of the disease lies. Recognizing the paucity of randomized controlled trials, I made an effort to search and retrieve high quality non-randomized experimental studies such

as quasi-experimental studies, pre/post-test studies, cohort/longitudinal studies.

The analysis focused mostly on five RCTs [11-15] and to a lesser extent on 'high quality' non-randomized evaluation studies [16-19,20-23] and other non-randomized studies. However, other closely related studies were found but not included in the analysis because they targeted men and women together (See Reference and Data Extraction for Table for studies not included in the analysis). It would, therefore, be difficult to separate results specifically for men.

The impact of the interventions was assessed in relation to changes in the attitude of men towards condom/gender roles or violence, changes in knowledge of HIV/AIDS/STI, changes in risk behaviour and changes in biological indicators. These outcomes were evaluated in the twenty-two included studies and they relate directly to the sexual risk of transmission of HIV between partners. The risk of transmission varies across different behavioural and biological factors. Multiple sexual partnership and unprotected sex are known to be major behavioural risk factors associated with HIV transmission [31]. HIV prevalence and untreated Sexually transmitted diseases are major biological factors [31]. Changes in outcomes also occurred to a varying degree in response to the interventions. The small number of high-quality rigorous studies also made it difficult to detect clearly the characteristics of interventions associated with effectiveness, although a clear trend is emerging.

Interventions with multiple contents appear to be more effective in producing positive behavioural outcomes. This finding is supported by the outcomes of Bing et al. [11], Lau JT et al. [14] and Cornman DH et al. [12]. Other moderate-quality non-randomized studies also reflect this trend. Fritz K et al. [13] evaluated multi-component intervention but reported no significant effect on behavioural outcomes. This is probably because interventions targeted men in beer halls and were under the influence of alcohol. Multi-component interventions produced more effects by targeting a different aspect of behaviour and utilize different methods to effect change. This favourable effectiveness of multi-component interventions is further supported by the findings of other studies that interventions which include Information, Motivation and Behaviour skills elements are more effective in changing AIDS risk behaviour [32]. The IMB skills model is the proposed model for promoting HIV risk reduction behaviour change [33]. It asserts that HIV prevention information, motivation, and behaviour skills are main determinants of preventive behaviour. Multi-component interventions may be largely more effective because the various components work synergistically to potentiate the overall effects of individual parts. In some ways, the various components may be indivisible from the whole [34].

Although the evidence base is narrow, interventions with a shorter delivery period were more effective in producing positive behavioural outcomes. Three interventions that produced positive significant effects [11,12,14] were delivered in less than 9 weeks. Bing EG et al. [11] assessed the outcomes 3 and 6 months after the intervention, Cornman DH et al. [12] assessed the outcomes after 10 months of intervention and Lau JT et al. [14] assessed the outcomes after 4 weeks. All outcomes have

significantly changed from baseline values at the end of the follow-up periods. The longer-term intervention impacts (after 12 months) have not been assessed. Although other factors may come to bear, Fritz K et al. [13] evaluated intervention delivered in fifteen months which did not produce positive impact. Kajupi P et al. [15] reported mixed results. Non-randomized studies which have lower quality showed a reversed trend-Interventions with longer delivery periods were more effective in improving outcome. However, the possibility of bias cannot be ruled out in producing these favourable outcomes. Data on nature of outcomes at multiple follow-up periods were not provided and so the trend in behavioural outcomes the long term cannot be ascertained. The finding that shorter intervention-delivery time was associated with the more positive outcome as observed in the most rigorous studies mean that brief and short interventions may be more effective, at least in this group of men. This finding is consistent with the findings of another review on MSM which reports that “significant intervention effects were also seen among studies with short intervention spans” [35].

Interventions effects are somewhat stronger in studies that have men with older age ranges as participants. Though also on a narrow base of evidence, the finding may underscore the need to develop a more dynamic strategy that will focus on younger men. Effects reported by Lau JP et al. [14], Cornman DH et al. [12] and Morisky DE et al. [21] are more statistically significant than effects by Kajupi P et al. [15] and Bing EG et al. [11]. Indeed, the interventions that did not produce any positive targeted men younger than 34 years. I assumed a priori that younger men are more sexually active, more likely to engage in risky behaviour and so more likely to resist change. Interventions targeting men at workplaces/working together produced a more positive effect than interventions targeting men in the community. This may be related to the fact the intervention messages may be reinforced by frequent discussions among participants who may be guided by other work-related discipline. Also, work-related settings may make it easier to ensure that all participants receive sufficient exposure to the intervention.

Although the evidence base is insufficient to conclude that interventions in which men participated in the process of design and implementation are more effective, the trend is in that direction. Men may be encouraged by positive results when they are given feedback about the intervention outcomes. More so, the sense of belonging to an organization which is concerned with their well-being may also encourage them to adopt positive behaviours.

The results for changes in knowledge and biological outcomes are favourable for all interventions. Changes in attitudes and condom use are favourable for all but one intervention and changes in the number of sexual partners/episode of unprotected sex are favourable for five out of nine intervention. This demonstrates that knowledge and attitude of men toward condom and gender roles/GBV are easier to change than a number of sexual partners/episode of unprotected sex. Result for biological outcomes is too small to warrant any quantitative conclusion though both studies reported positive changes.

Evaluation methodologies reported mixed effects with respect to behavioural outcomes. Though all studies have an adequate level of randomization, the fact that some RCTs with smaller sample sizes reported positive intervention effect and some reported negative intervention effect means that no clear trend is emerging. I also assumed a priori that very small sample size may be a threat to both the internal and external validities of the primary studies. The number of studies is too small to show a clear pattern of the relationship between sample size and intervention effect.

## LIMITATIONS

Although this systematic review has shown that behavioural intervention is effective in improving behavioural factors associated with heterosexual transmission of HIV, there are limitations in the research process and the methodology itself.

### Limited datasets

This systematic review should not be considered a replacement for individual properly and sufficiently designed studies evaluating the intervention effects on behavioural outcome. It only synthesizes the evidence across studies. Though much effort has been put to retrieve high-quality studies, all available relevant articles may not have been identified due to time and resource constraint. Indeed even the best literature search might not uncover all available research evidence. These omissions invariably reduce the power of inference from this review albeit to a limited extent.

### Heterogeneity

This systematic review encompasses studies with marked heterogeneity in intervention, design, and outcomes. These have complicated all levels of the research work including analysis. Statically meta-analysis, though carries greater statistical powers, was not applicable in this project because of the qualitative and heterogeneous nature of the primary studies. Great heterogeneity participant's population increases the generalizability of the overall results. By contrast, great heterogeneity in outcomes/results may reduce the power of inference about the overall effect [9]. The implication of this is that evidence of strong intervention impact in the systematic reviews with huge participant heterogeneity increase inference from the review because the impact was evaluated across hugely different participant groups.

### Low statistical power

Primary studies that are not RCTs have been included in the review since a large number of RCTs is not available. Although effort has been made to synthesize evidence across rigorous studies, the inclusion of non-randomized studies which are subject to bias would reduce the power of the inference from this study. In addition to the heterogeneous nature of study outcome and qualitative nature of data synthesis, the small number of RCTs may further bias this review.

Ideally, more than one independent researcher should undertake a quality assessment of primary studies; I assessed the

quality of the included here but tried to be as objective as possible.

### Implications for future research and policies

This systematic review has highlighted that behavioural interventions targeting men can be effective in preventing heterosexual transmission of HIV. It is however widely agreed that the development of dynamic and effective behavioural intervention strategies remain an important option, at least for now, since other methods such as effective vaccine are yet to become available.

Indeed, the number of high-quality rigorous studies evaluating the existing interventions is very small. This clearly underscores the need for more research; employing rigorous methods to expand the evidence base for effectiveness of interventions targeting to prevent heterosexual transmission of HIV in developing countries. In addition, most of the randomised controlled trial in the existing literature only evaluated the intervention effects in the short-term [35]. The long-term trend and sustenance of the positive behavioural outcomes also remain largely unknown. There is a need for research to evaluate the long-term impacts of such interventions. The interplay of different factors that determine individual's vulnerability to HIV also means that focusing on a particular intervention or evaluation methodology approach would be hugely insufficient. A variety of research approaches is needed to illuminate the areas of concern, acceptability, practical constraints and related issues. Behavioural interventions to prevent new infections are by no means a static process. To design more effective interventions in the future, we need to generate more evidence by conducting rigorous evaluation studies and expand our knowledge on the area of strengths and weaknesses in the current practice.

Though the evidence base is narrow, it appeared that interventions with multiple components were more effective in influencing men to adopt protective behaviours. Policymakers and programmers focus on designing and implementing multi-component as they are likely to produce better outcomes.

The current evidence albeit limited posits that interventions with a shorter delivery time appear to be effective in producing positive outcomes. Similar findings were reported in another systematic review [35]. This is contrary to what might be expected, that longer-lasting intervention provides greater exposure time, and opportunity to reinforce intervention messages. Further research is needed to expand the evidence base and uncover why this is so.

As far as possible, programmers should strive to tailor interventions to different context; culturally, socially and demographically. Interventions designed to target men in the community, younger people and those who are economically disadvantaged should consider contextual factors limiting effectiveness. Those interventions shown to be promising should be evaluated in larger rigorous trials that emphasize biological outcomes as these are better indicators of effectiveness than behavioural outcomes. Though men's participation in the

intervention process appears to be associated with effectiveness, more research is needed to expand this evidence.

### CONCLUSION

This is a systematic review of interventions designed to prevent transmission of HIV among heterosexual men in developing countries. Heterosexual transmission is the main mode of transmission of HIV here and behavioural interventions are important prevention strategy. The number of rigorous studies evaluating these interventions is too small to provide a substantial body of evidence. It may, however, be cautiously concluded from the available evidence that interventions can be effective in reducing heterosexual transmission of HIV.

The intervention type associated with the greatest effectiveness is multi-component intervention and shorter delivery time. There is insufficient evidence to establish a dose-response relationship. Experienced and older men appear to respond more to the interventions especially when targeted at workplace setting than at the community level.

Among men, knowledge, and attitudes are easier to change than the number of sexual partners/episodes of unprotected sex with CSW/other sexual partners. There is no sufficient evidence to draw a conclusion on the relationship between the evaluation process and effectiveness of behavioural interventions to reduce heterosexual transmission of HIV among men.

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