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Review article

Involving fathers in prevention of mother to child transmission initiatives – what the evidence suggests

Lorraine Sherr and Natasha Croome[§]

[§]**Corresponding author:** Natasha Croome, Research Department of Infection & Population Health, Royal Free and UC Medical School, UCL, Rowland Hill St., London NW32PF, United Kingdom. Tel: +44 207 830 2129, Fax: +44 207 794 1224. (n.croome@ucl.ac.uk)

Abstract

Introduction: The current UNAIDS goal towards virtual ending or elimination of infants acquiring HIV by 2015 is perhaps the most achievable goal to date. Yet, models show that delivery of antiretroviral compounds alone will not suffice to achieve this goal, and a broader community-based approach to pregnancy, families and HIV is needed. Such an approach would highlight the important role of men in reproduction. Although early studies have shown it is cost-effective to include males, very few interventions have proceeded to involve men.

Methods: This review utilized systematic review techniques to explore the literature on effective interventions for the inclusion of men in the prevention of HIV to infants. A key word search of literature sources generated 248 studies for hand sorting and interrogation. Of these, 13 were found to contain some information on involvement of males in some form of provision. Data were abstracted from these and form the basis of this review.

Results: Background descriptive studies painted a picture of low male involvement, poor male inclusion and barriers to engagement at all stages. Yet, pregnancy intentions among men affected by HIV are high and the importance of fathers to family functioning – from relationships, through conception, pregnancy and parenting – is well established. Search strategies for interventions for males in HIV and pregnancy were used to generate studies of sufficient quality to inform strategies on the future of male involvement. Of the 317,434 papers on pregnancy and HIV, only 4178 included the term male (paternal or father). When these were restricted to intervention studies, only 248 remained for hand sorting, generating 13 studies of relevance for data extraction. The results show that all these interventions were concentrated around male partner HIV testing. In general, male partner testing was low and was amenable to change by offering voluntary counselling and testing (VCT) information, providing couple-based testing facilities and encouraging male attendance. All interventions used indirect approaches to men via their pregnant spouse. Non-health facility (clinic or hospital)-based provision (such as testing facilities in the community in bars and churches) were more effective than healthcare facilities in attracting male participation.

Conclusions: In conclusion, the review showed that approaches to men are limited to HIV testing with little innovative planning and provision for male treatment and care. As such, initiatives run the risk of alienating rather than including males. Direct approaches and the provision of male-specific facilities and benefits should be explored.

Keywords: HIV; PMTCT; fathers; male involvement; VCT.

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Introduction

The UN aim of virtual elimination of HIV infection to end infection in newborns is an achievable goal [1]. There is efficacious treatment for HIV-positive women during childbirth, and the guidelines for infant feeding have shown dramatic progress to ensure that pregnancy and postpartum infection is limited. Rollout of such interventions is seen as highly cost-effective [2]. However, although the goal is simple, it will not be simply achieved. In order to deliver any programme of HIV prevention and treatment to pregnant women with HIV, a comprehensive HIV testing programme needs to precede so that HIV infection is identified. Once identified, treatment rollout and full adherence to efficacious regimens are also preconditions of effectiveness. Both funds and human resources need to be in place to ensure such rollout, and recent studies have warned against potential bottlenecks at this level [3]. A narrow vision of HIV in pregnancy may result in ineffective rollout. Indeed mathematical modelling has shown that, even with full treatment availability, not all pregnant women will be reached [4]. It appears that a more comprehensive understanding of pregnancy within the family and society may be needed to locate such interventions and enhance their effectiveness.

In this paper, the role of fathers in pregnancy is explored, including the philosophy and benefits of paternal inclusion as well as the cost of excluding fathers on family outcomes. It has long been established that fathers play an important role in childbirth, yet there is a dearth of literature on paternal contributions and roles either because they are excluded or understudied in empirical investigations. As the

importance of fathers in child outcomes is documented, the movement to include fathers in research and programmes has grown. There are distinct fertility issues for HIV-positive men [5] and potential interventions [6]. The literature is examined to summarize what is known of paternal engagement including barriers that exist, the nature and extent of engagement, facilitators to such engagement and impediments that have been described in the literature. This is followed by a systematic review of intervention initiatives to engage fathers in childbirth in the context of HIV.

Fathers play a key role in various stages and phases of family functioning, from relationship formation to contraception, family planning, pregnancy and support. Fathering is a crucial component of family and child experience. Yet, healthcare services do not automatically involve males. In some settings, fathers are included in antenatal preparation classes, and in the modern era – again in some settings only – fathers have been included in labour and delivery [7]. Emerging literature suggests that male transitioning to parenthood has psychological challenges [8]. Expectations and stress levels have been shown to be elevated for men with implications for bonding with their child [9]. There is no reason to believe that such generalized findings do not apply also to fathers affected by HIV. Given the sharp contrast between paternal engagement at the community level in comparison to the healthcare level, it is important to understand why this is so. It may be that pregnancy is viewed within a gender lens, confining the approaches to the pregnant woman only. This represents a somewhat simplistic approach. Such approaches represent a short-sighted vision and align with a biomedical model, which locates childbirth in obstetrics, rather than a broader social science model, which requires a community and social context.

The literature suggests that it makes good sense to incorporate fathers into pregnancy approaches, as there appears to be evidence that male partner support is important for optimum outcomes in the realms of infant feeding [10], HIV test uptake, clinic attendance and continuing to use treatment services [11]. Conversely, the lack of male support, or even the fear of negative reactions from male partners, is associated with lowered HIV test uptake, reduced disclosure and lowered adherence. Some interventions in male populations have focussed on pregnancy prevention and risk behaviour reduction [12], and these have often been effective [13]. Indeed, much of the literature concentrates on pregnancy prevention rather than pregnancy promotion [14], perhaps revealing an underlying bias that unintended pregnancy was of greater importance to study than intended pregnancy. Indeed, one study exploring fertility desires of people living with HIV in Nigeria noted that 63.3% desired a child (some more than one child) and reports ''fertility desires and intentions of these patients poses *a threat* to preventive strategies.''

In HIV, there are a number of potential male reproduction concerns. These relate to HIV testing in the first place, the whole issue of partner or couple testing, male involvement in planning a pregnancy in the presence of HIV and subsequent care when the pregnancy is achieved. Male involvement is not only confined to obstetric care but should also be extended to family planning, fertility treatment and termination of pregnancy clinics. The issue of discordant and concordant couples needs to be addressed in terms of not only conception options but also in HIV transmission prevention in the pursuance of conception. Male involvement in mode of childbirth, continuing to use treatment services and feeding decision-making needs to be understood as well as the factors associated with parenting a child in the presence of HIV. Couple counselling programmes have been studied to explore uptake of HIV testing and reduction of HIV transmission, risk behaviour and abuse [15].

A recent systematic review of pregnancy intention among fathers identified 14 studies on male perspectives and pregnancy intentions [16]. All showed consistent high desire for a child in the presence of HIV. Some studies explored the effect of disclosure on such desires and showed that lack of disclosure of HIV status to a partner was associated with elevated desires for a child [17]. This literature suggests that male views on parenting are important. It is surprising that HIV testing of male partners has been neglected for so long. As far back as 1999 [18], cost-effectiveness analysis showed considerable benefits for male partner testing, which would identify HIV positive fathers and thereby intervene to prevent new transmission to pregnant women and obviate infants acquiring HIV, which could be heightened if the mother had newly acquired HIV [19]. Male involvement in pregnancy and childbirth is seen as an important factor in various domains [20]. Most of the literature explores the effect on maternal or infant outcomes, yet there may also be benefits for the men themselves. Male involvement indices exist [21]. Male involvement may not simply be a function of male motivation but may relate to service availability, ease of access, social and cultural norms and provision [22]. The rapid rollout of HIV testing for woman is often seen as an indirect test or challenge to men, who are rarely consulted or involved and feel strongly about HIV testing of their partners. Kakimoto *et al*. showed that couple involvement played a key role in HIV testing acceptance. When a special class to provide information on HIV testing was set up, which initially invited pregnant women to attend and then couples, HIV test acceptance rate of those who attended alone was much lower than those with partners (18.7% vs. 85.1%) [23]. John *et al*., as far back as 2003, used Kenyan data to explore the impact of couple counselling and noted that, although only 11% received couple counselling, this was effective at averting a greater number of infants acquiring HIV than woman only testing and was cost effective [24]. Msuya *et al*. in Tanzania found that low partner attendance at HIV testing was a predictor of failure to return for test results [25]. Kizito *et al*. in Uganda [26] looked at 20,738 female antenatal attendees and noted that only 1.8% of male partners accepted HIV testing compared to 62.8% uptake for pregnant women. They found an even lower male uptake of syphilis testing – 82.2% of women compared to 1.1% of men. Identifying discordancy is a specific HIV prevention opportunity that is missed if partner testing is overlooked.

The benefits of partner testing go beyond prevention of transmission to infants. Desgrées-Du-Loû *et al*. showed in Cote d'Ivoire that partner testing was associated with spousal

communication and subsequent condom use [27]. Although some studies raise fears of abuse and negative outcomes for women, Semrau *et al*. in Zambia showed that couple counselling did not increase the risk of adverse social events for women [28]. In a systematic review of counselling for HIV testing in pregnancy, Minnie *et al*. identified 33 studies, but none discussed partner testing, other than reference to desirability of couple testing [29].

Few researchers directly explore HIV treatment of fathers and the effects on subsequent mortality and both adult and child outcomes. These data need to be inferred, yet a recent large scale study in Uganda following up 5974 people (1373 HIV-positive and 4601 HIV-negative) showed that the provision of antiretroviral treatment to adults was associated with a 95% reduction in mortality among participants living with HIV and an 81% reduction in mortality in their young children not living with HIV (<10 years) [30]. Clearly, a family approach needs to start addressing the role of fathers and understand paternal need as well as the advantages of provisions for fathers.

There does not seem to be any global policy on male involvement in HIV testing in pregnancy or ongoing vertical transmission provision. Mirkuzie *et al*. in Ethiopia studied 663,603 pregnant women from 2004 to 2009 where 13.5% (986) were HIV positive and showed that male testing was low at only 4.9%, with a worrying decline over time by 14% from 2004 to 2009 [31]. Thus, in the absence of any direct policy, male testing in HIV pregnancy may represent a seriously missed opportunity.

Generally, it appears that current HIV testing initiatives are less successful at reaching men than women. A recent study in South Africa showed a 3:1 ratio of testing when comparing females to males [32], even when controlling for pregnancy-related testing. Were *et al*. showed that home-based couples testing increased paternal test uptake [33]. They visited homes of 730 people living with HIV in their study to offer counselling and testing to other household members. Of 2373 household members visited at home, 99% accepted voluntary counselling and testing (VCT). In this study, 120 spouses accepted testing, of whom 57% were found to be HIV positive – 99% of whom had not previously tested. Studies indicate that HIV testing in antenatal clinics is not reaching out fully to men. The environment is not conducive, the way of operationalizing the request or invitation to test is often mediated through women and is thus an indirect invitation and may be perceived with lower validity or desirability by men. Furthermore, using women as a testing go-between may add an unnecessary burden on their shoulders. Men report that the antenatal environment is a women's environment and not conducive to their attendance [34]. Qualitative studies point out the contradiction between male beneficial attitudes towards HIV testing in pregnancy and the low uptake, suggesting that this implies external barriers to access [35,36].

Given this general background, this study was set up to examine interventions to increase male involvement in prevention of infants acquiring HIV during pregnancy so that a clear understanding of initiatives that are effective can be fostered. A systematic review was carried out to explore interventions in prevention of vertical transmission initiatives or general pregnancy programmes aimed at male involvement around HIV prevention, management or care. The aim of the review was to identify any interventions (programmes, community or healthcare based) with a paternal component and to summarize the knowledge base on the efficacy of such interventions.

Methods

A systematic review protocol was devised for the identification, retrieval and appraisal of evidence on interventions for fathers in HIV-related pregnancies.

Search strategy

In December 2011, three electronic databases were searched: MEDLINE, PsycINFO and the Cochrane data base.

Search terms

Subject subheadings and word truncations were entered according to database requirements to map all possible key words. With a combination of ''or'' and ''and'' functions, we conducted a search using the following key terms: AIDS; HIV; Acquired Immunodeficiency Syndrome, pregnancy, antenatal, prenatal, prevention of mother to child transmission (PMTCT) and intervention(s). Secondly, we searched for terms male (man or men), paternal and father. Search strategies were then intersected to generate potential papers. Details on the specific search terms, combinations and papers generated are set out in Table 1 below.

Inclusion/exclusion criteria

Two hundred and forty-eight papers generated from the resulting search were hand sorted to establish final inclusion. Papers were first selected based on relevance to the topic if they related to any HIV and pregnancy/reproduction or fertility situation and included male involvement or male measures. In order to identify high quality, robust evidence, study design criteria were applied to seek out clinical trials; comparative studies, studies with control groups;

Table 1. Search strategy and results

Term		Yield	Papers
1	HIV	234,235	
2	AIDS	183,814	
3	Acquired immune deficiency syndrome	81,398	
4	1,2,3 combined with ''or'' command		317,434
5	Pregnancy	709,589	
6	Combined with 4 with ''and'' command		14,462
7	Male	5,867,582	
8	Father	27,497	
9	Paternal	15,908	
10	Combined 7,8,9 with ''or'' command	5,879,198	
11	Combined 10 with 6 ''and'' command		4178
12	Intervention	273,608	
13	Combined 12 with 11 ''and'' command		**248**
14	Hand search for relevance and inclusion		**13**

interventions (HIV test offering) with pre–post or comparison group measures. Target populations included all those in pregnancy care or identified through pregnancy where the issue of HIV infection, HIV testing or HIV prevention interventions were reported. Types of articles excluded were reviews, book chapters, dissertations, letters or editorial opinions. Excluded target populations were non-HIV (including those in high risk groups for HIV). Study types excluded were case report, studies without intervention or comparison/control groups or descriptive qualitative studies, which were retained for examination in terms of core concepts to inform the discussion but not included in the data extraction. References from included studies were followed up to ensure broad coverage and inclusion. Non-English articles were also excluded.

Results

From the 248 studies, 13 were found to contain some information on involvement of males in some form of provision. The data from these 13 were extracted to provide geographical location of study, sample details, any description of intervention or conditions, specific findings related to males and outcomes. These studies are summarized in Table 2 below.

All 13 studies were centred around the issue of HIV testing of males. Interventions were either specific VCT provision or evaluations of routine HIV testing offers and invitations on male uptake and outcome.

On the whole, male attendance was low (16% in Katz *et al*. [37,38], 31% Aluisio *et al.* [39], 12.5% Msuya *et al.* [40], 22% Ditekemena *et al.* [41], 15% Farquhar *et al.* [42], 2.9% Homsy *et al.* [43] and 0.6% Sherr *et al.* [44]). A randomized-controlled trial to improve male HIV testing was conducted by Ditekemena *et al*. in the Democratic Republic of Congo. The study included 2706 pregnant women whose partners were invited to VCT according to a random schedule varying location (bars, churches and health centres). Only 591 (22%) attended – 99.6% of whom had an HIV test — but were significantly more likely to do so at bars than at healthcare centres. Furthermore, couple counselling uptake was greater at bar and church venues than at healthcare centres. Msuya *et al.* in Tanzania followed up 2654 pregnant women and reported that only 332 (12.5%) males responded to VCT invitations, many (40%) postdelivery. On the other hand, Msuya *et al.* reported that weekend opening did not affect partner testing uptake and Katz *et al.* reported that 94% of men viewed the antenatal setting positively (however, their sample was drawn from antenatal clinic attendees and may thus be skewed). Conkling *et al*. [45] in Kigali and Lusaka utilized weekend testing to monitor the effects of couple testing compared to women testing alone. They followed up 3625 women of whom 1619 received couples care and 2006 were tested alone. Weekend test was feasible, and couple counselling was associated with lower loss to follow-up but had no effect on nevirapine use.

The studies reported on specific interventions to enhance uptake of male HIV testing during pregnancy and the consequences of enhanced male testing. A randomized-controlled trial (Mohlala *et al*. [46]) among a sample of 1000 pregnant women showed that an intervention involving a written invitation to attend VCT compared to a control group with general pregnancy information enhanced uptake of counselling and testing and also reduced subsequent unprotected sex during pregnancy. A simple invitation reaching out to male partners enhanced attendance and HIV testing uptake in Uganda (Byamugisha *et al*. [47]). Male involvement was associated with a number of positive short- and long-term pregnancy and relationship outcomes. Aluisio *et al*. in Kenya found a significant positive relationship between male attendance and infant outcomes. They followed up 456 female participants for one year and reported that 140 partners (31%) attended the clinic and such attendance was associated with reduced HIV acquisition and infant mortality. Msuya *et al*. in Tanzania reported that male attendance was associated with numerous positive outcomes for the subgroup diagnosed with HIV – a threefold uptake of antiretroviral treatment, a fourfold increase in breastfeeding avoidance and a sixfold increase in continuing to use services to support feeding choices. Farquhar *et al*. [42] in Kenya showed an association between male partner involvement and intervention uptake, breastfeeding avoidance and condom use. Msuya *et al*. in Tanzania also found an association between partner involvement and intervention acceptance, as well as continuing to use services to support infant feeding methods. Mohlala *et al*. in South Africa reassuringly demonstrated no differences in intimate partner violence but showed reduced sexual risk behaviour for those in the intervention group. Desgrées-Du-Loû *et al*. [27] in Cote d'Ivoire demonstrated an association between partner testing and communication as well as condom use postdelivery.

Twelve of the thirteen studies were conducted in Africa. The only UK study reported startlingly low inclusion of males (0.6%) [44]. No data from North or South America, Asia or Australasia on male involvement and interventions were identified.

Discussion

The literature and this systematic review show a growing understanding of male involvement yet point out the need for much more robust study and inclusion. Involvement of males has beneficial outcomes for women and children. This is either through direct or indirect pathways such as support or increased treatment adherence.

HIV testing of male partners is low

Early data have shown that it is cost-effective to offer HIV testing to male partners of pregnant women [18] and this has been well established for over 13 years [19]. This has benefits for HIV prevention to the pregnant woman, the male partner and the infant, as well as allowing for early identification and pathways into treatment for HIV positive males. Yet, this has not converted into policy at the same pace as maternal HIV testing. It is also clear that interventions do exist to promote HIV testing of male partners, and these can be effective. Outside of pregnancy as well as within antenatal care, couples counselling and testing is more effective than individual counselling for male HIV testing uptake. Randomized control data suggest that a specific VCT provision will attract

Table 2. Data extraction of studies of male involvement in HIV and pregnancy

Study	Intervention	Female participants	Male outcomes	Male partner attendances associations
Aluisio *et al*. [39]	HIV-positive pregnant women encouraged to invite partners to participate in antenatal care. Provision of HIV testing (Kenya)	456 female participants	140 male partners attended (31%)	Male attendance associated with monogamy, previous testing, discussions. Continuing to use services not associated. Male testing and discussion associated with formula feeding. Lower amount of infants acquiring HIV (40% reduction)
Ditekemena *et al*. [41]	Pregnant women attending an antenatal clinic were given an invitation for their male partner for HIV counselling and testing (VCT) Democratic Republic of Congo (DRC)	2706 female participants. Randomized control trial (RCT) (health centre bar or church) for partner VCT	591 male partners attended (22%), significantly higher in non-healthcare settings (bars)	Not measured
Mohlala *et al*. [46]	All pregnant women were given an invitation for their male partner to join either a PIS or VCT (South Africa)	1000 female participants. RCT to two conditions (VCT or PIS)	Significantly more male partners attended VCT session (35%) than PIS (26%). 32% vs. 11% tested for HIV. Significant effects of VCT group on unprotected sex in pregnancy.	No effects on intimate partner violence. Reduced unprotected sex in pregnancy associated with VCT group.
Msuya *et al*. [40]	Pregnant women attending vertical transmission treatment were encouraged to inform and invite male partners for HIV-VCT (Tanzania)	2654 female participants	332 male partners (12.5%) attended HIV-VCT	Higher uptake of ART with partner participation (91% vs. 74%), avoidance of breastfeeding (19% vs. 6%) and infant testing uptake.
Katz *et al*. [37,38]	Women attending an antenatal clinic were asked to invite their partners to VCT (Kenya)	2104 female participants	1993 women requested male partner attendance; 313 (16%) men attended, 183 individual VCT.	Male ANC testing did not relate to disclosure.
Farquhar *et al*. [42]	Women attending an antenatal clinic were encouraged to return with their male partners for VCT and were offered couple posttest counselling (Kenya)	2104 female participants	308 male partners participated in VCT (15%), of whom 116 were couple counselled (38%)	HIV prevalence was lower among women whose partner attended clinic. Partner involvement associated with threefold increase of Nevirapine use, breastfeeding avoidance and condom use.
Oladokun *et al*. (2010) [57]	Women attending antenatal clinics (Nigeria) were encouraged to invite their partners for HIV testing via word of mouth.	51,952 female participants (51,614 accepted HIV testing)	361 (16.7%) male participants accepted HIV testing	Not measured
Byamugisha *et al*. [47]	Women attending an antenatal clinic in eastern Uganda were either given a written invitation (intervention) or an information sheet (control) to see which partners would attend the clinic and be HIV tested	1060 female participants (530 in each group). Letter to spouse (invitation vs. information)	Attending the clinic – 86 male partners in the intervention attended (16.2%) and 75 in the control group attended (14.2%) HIV testing – 82 of the 86 male partners in the intervention group were tested (95%) and 68 out of 75 men were tested in the control group (91%)	Not measured

Table 2 (*Continued*)

Study	Intervention	Female participants	Male outcomes	Male partner attendances associations
Desgrées-Du-Loû *et al*. [27]	HIV-positive, HIV-negative and women who refused an HIV test were offered prenatal counselling and HIV testing in Cote d'Ivoire. All female participants were encouraged to suggest HIV testing to their partner (Cote d'Ivoire)	710 female participants – 306 HIV-positive women, 352 HIV-negative women and 52 untested women	41 women had male partners tested (26 HIV-positivewomen, 14 HIV-negative and 2 refusers). Of male partners previously untested: 25% of women living with HIV, 13% HIV-negative women and 6% of previously untested tested for HIV.	High level of communication (irrespective of HIV status), and increased condom use on sex resumption after delivery.
Brou *et al*. (2007) [58]	Women attending antenatal care had an HIV test in Cote d'Ivoire were suggested to encourage partners to take a HIV test. Over the next two years, disclosure to their partner and the partner having an HIV test was measured.	939 female participants – 545 tested positive and 393 tested negative	Two-year follow-up: 96.7% of women who tested negative disclosed to partner vs. 46.2% who tested positive. 23.1% of male partners of HIV negative women test vs. 14.8% of HIV-positive women. Male partners of HIV-positive women who disclosed status more likely to test (37.7% vs. 10.5%)	Not measured
Conkling *et al*. [45]	Two clinics (Rwanda and Zambia) compared mother and couple testing. Couples were tested when the woman chose to attend with partner. All women received invitation letter to either couple or antenatal testing.	1940 women enrolled in Kigali (984 VCT, 956 couples' voluntary counselling and testing [CVCT]) and 1685 women enrolled in Lusaka (1022 VCT, 663 CVCT). 1619 couples tested, 2006 women alone.	HIV prevalence (14%). CVCT associated with reduced loss to follow-up: Kigali, 31% couples vs. 36% ($p = 0.011$); and Lusaka, 22% couples vs. 25% ($p = 0.137$). HIV-positive women with follow-up, CVCT had no impact on nevirapine use (86% to 89% in Kigali; 78% to 79% in Lusaka).	Partner participation was not associated with differences in nevirapine use.
Homsy *et al*. [43]	Antenatal and postpartum HIV testing of women and accompanying male partners (no specific invitation described). (Uganda)	3591 pregnant women and 104 male tested (2.9%). Postpartum, 522 women tested, and 176 males.	Only 2.9% women had male partners tested in the antenatal clinic (ANC), 25% on the maternity ward. 48% (51/107) ANC couple counselling, 72% (130/180) in the maternity ward. Couples counselled together 2.8% of all persons tested in ANC, 37% of the maternity ward.	Not measured
Sherr *et al*. [44]	HIV test uptake in antenatal care over two time periods. (United Kingdom)	3560 women, (2710 in 2002; 850 in 2004).	0.6% partners offered HIV test.	Not measured

ART, antiretroviral treatment; PIS, pregnancy information session.

male partner attendance and subsequent HIV testing uptake. These results need to be repeated in other settings to explore the extent to which they generalize.

Male partner HIV testing benefits

The studies listed a number of benefits associated with partner testing. Aluisio *et al*. demonstrated an association between partner testing and reduced vertical transmission. Furthermore, infant mortality was lower with male attendance, even when adjusted for maternal viral load and breastfeeding. It seems that male involvement can start addressing disclosure problems, enhance communication and have added benefits. The only study that looked at intimate partner violence showed no increases as a result of partner testing.

Yet, the data are somewhat disappointing in that only 13 studies could be identified, and for many, the ''intervention'' was the offer of HIV testing in some form or other, enhanced at times with couple counselling, but very little else was on offer. The review reveals an enormous gap in provision. Of the 13 studies, all of them concentrated on HIV testing and counselling for male partners. No studies were found with any other constructive intervention for men during the period of pregnancy.

The qualitative data reveal a number of barriers for men in terms of involvement in healthcare provision and initiatives for women and these data should inform future strategies and policies. Men see the antenatal environment as a woman's domain and find it hard to navigate [34]. Indeed, a randomized-controlled trial providing different venues for VCT found significantly higher uptake in non-healthcare locations such as bars and churches. Two studies explored the feasibility of weekend testing to try and accommodate conflicting work demands for men. This was found to be feasible and attracted couples to test [40,45].

Community involvement

Studies exploring community involvement need to differentiate between interventions by community groups, with community groups, in the community or with the community. Using all these possible definitions, no one study reflected community involvement as such. All initiatives seem to emanate from clinic provision, and the models of intervention were all comparatively simple – often involving invitation letters, location variation or the provision of educational/information sessions.

Conclusions

More to men's needs than HIV testing – a missed opportunity

If men are to be involved from a family perspective, the narrow approach concentrating purely on HIV testing will need to be dramatically widened. Pregnancy provides an opportunity for healthcare screening and provision for men and if they are to be engaged, there ought to be something provided specifically for them. Support for their HIV-positive partners is associated with beneficial long-term outcomes, and interventions to enhance, enable or encourage such support need to be operationalized and evaluated. Indeed, lack of support, dialogue and discussion with partners was a predictor of pregnant females not returning for HIV test results [25]. Even in low prevalence settings male reach is low. A study published after the systematic review [55] invited 1,243 male partners of 2,400 London women attending ultrasound to undergo testing. 430 (18%) accepted and although there were no HIV positive tests, 16 other infections were diagnosed (hepatitis C, hepatitis B and C trachomatis), clearly pointing to the wider range of health needs which should be considered. As these infections could also affect the pregnancy HIV testing only would not have identified theses infections.

None of the studies mentioned referral to HIV treatment for positive men to ensure parental survival. Paternal death is associated with many adverse child development outcomes, and the ideas around MTCT-Plus [56] should extend to fathers. No studies even mentioned the need for paternal treatment, yet many do now identify the importance of maternal treatment if HIV is identified in pregnancy. Keeping mothers alive has been shown to be an additional important component of any strategy for infant wellbeing [48]. Yet, this should now be extended to keeping fathers alive as well. Paternal contributions to maternal wellbeing as well as infant and family development are well established in the broader literature [49,50] but do not seem to be contained in HIV provision. Any integration of services must now look to the benefits for male partners beyond simple establishment of HIV status.

Future considerations

The studies suggest that men are willing to engage, yet often feel marginalized or of secondary importance. Indeed, almost all of the interventions did not directly approach men and used women as a proxy to invite or take messages to their partners for attendance and inclusion. Direct approaches may help to engage men. Home-based couple testing initiatives with direct invitations to male household attendees showed an extremely high engagement and uptake rate. No studies examined female partner perspectives on male involvement nor addressed any possible negative effects of male involvement, despite the fact that, in the non-HIV literature, these are considerations [51,52].

There is more to male involvement than HIV testing, and if virtual elimination of infants acquiring HIV is to be achieved, wider involvement of fathers at all stages of care, treatment and provision must be explored. Solid design and evaluation of strategies are important so as to control for potential bias associated with measures of men who are already committed and keen to attend [53]. Staff views, skills and needs to effect such changes are incompletely understood. As the potential benefits of integrated care are being considered [54], inclusion of male provision should be actively pursued, in terms of policy, procedure, funding and environmental changes to facilitate and welcome men, reach out to appropriate venues to make services available and to monitor the effects of such changes on men and women alike.

Authors' affiliation
Research Department of Infection & Population Health, Royal Free and UC Medical School, UCL, London, United Kingdom

Competing interests
The authors declare that they have no competing interests.

Authors' contributions

LS devised, researched and wrote the paper. NC contributed to the systematic review in terms of key word searches, article filtering and data abstraction. The final paper was jointly edited. All authors have read and approved the final version.

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