Is the sexual behaviour of young people in sub-Saharan Africa influenced by their peers? A systematic review

Elizabeth Fearon a, *, Richard D. Wiggins b, Audrey E. Pettifor c, James R. Hargreaves a

a Department of Social and Environmental Health Research, London School of Hygiene and Tropical Medicine, 15-17 Tavistock Place, London WC1H 9SH, United Kingdom

b Department of Social Science, UCL Institute of Education, University College London, 20 Bedford Way, London WC1H 0AL, United Kingdom

c Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina, Chapel Hill, 2101D Meigsman-Greenberg Hall, 135 Dauer Drive, Campus Box 7435, Chapel Hill 27599-7435, USA

A R T I C L E   I N F O

Article history:
Received 19 May 2015
Received in revised form 28 September 2015
Accepted 30 September 2015
Available online 9 October 2015

Keywords:
Systematic review
Young people
Peer exposure
Social networks
Sexual behaviour
Sub-Saharan Africa

A B S T R A C T

Adolescents in sub-Saharan Africa are highly vulnerable to HIV, other sexually transmitted infections (STIs) and unintended pregnancies. Evidence for the effectiveness of individual behaviour change interventions in reducing incidence of HIV and other biological outcomes is limited, and the need to address the social conditions in which young people become sexually active is clear. Adolescents’ peers are a key aspect of this social environment and could have important influences on sexual behaviour. There has not yet been a systematic review on the topic in sub-Saharan Africa.

We searched 4 databases to find studies set in sub-Saharan Africa that included an adjusted analysis of the association between at least one peer exposure and a sexual behaviour outcome among a sample where at least 50% of the study participants were aged between 13 and 20 years. We classified peer exposures using a framework to distinguish different mechanisms by which influence might occur.

We found 30 studies and retained 11 that met quality criteria. There were 3 cohort studies, 1 time to event and 7 cross-sectional. The 11 studies investigated 37 different peer exposure-outcome/sub-group associations. No studies used a biological outcome and all asked about peers in general rather than about specific relationships. Studies were heterogeneous in their use of theoretical frameworks and means of operationalizing peer influence concepts. All studies found evidence for an association between peers and sexual behaviour for at least one peer exposure/outcome/sub-group association. Of all 37 outcome/exposure/sub-group associations tested, there was evidence for 19 (51%). There were no clear patterns by type of peer exposure, outcome or adolescent sub-group.

There is a lack conclusive evidence about the role of peers in adolescent sexual behaviour in Sub-Saharan. We argue that longitudinal designs, use of biological outcomes and approaches from social network analysis are priorities for future studies.

© 2015 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

1. Introduction and rationale

HIV prevalence remains high in sub-Saharan Africa and reducing incidence in adolescence is critical (UNAIDS, 2014). The majority of HIV transmission in sub-Saharan Africa occurs via sex and risk of infection varies by sexual behaviour, including early sexual debut (Stockl et al., 2013; Wand and Ramjee, 2012), having multiple partners, and inconsistent condom use (Pettifor et al., 2005). The characteristics of young people’s sexual partners might also influence risk and some studies have found having older partners to increase risk among young women (Gregson et al., 2002; Kelly et al., 2003; Pettifor et al., 2005).

However, individuals’ behaviours take place within a wider social environment and in the context of their social relationships. Adolescents’ peers have been found to be influential on sexual behaviour in other settings (Ali and Dwyer, 2011; Billy and Udry, 1985). Peers, who grow in importance as children transition to adolescence (Berndt, 1979; Steinberg and Monahan, 2007), might also play an important role in influencing the sexual behaviour and

* Corresponding author.

E-mail addresses: Elizabeth.Fearon@lshtm.ac.uk (E. Fearon), r.wiggins@ioe.ac.uk (R.D. Wiggins), apettif@email.unc.edu (A.E. Pettifor), James.Hargreaves@lshtm.ac.uk (J.R. Hargreaves).
thus the long-term health of adolescents in sub-Saharan Africa.

There are a variety of mechanisms by which peers could be influential on sexual behaviour. Adolescents could be influenced via normative mechanisms, with norms being either ‘descriptive’, that is the perceived prevalence of a behaviour amongst peers, or ‘injunctive’, that is the perceived peer approval of a behaviour (Cialdini and Reno, 1990). Alternatively, adolescents’ connections to their peers could help to buffer them against stresses and potentially decrease risky sexual behaviours (Alloway and Bebbington, 1987; Barker, 2007; Markham et al., 2010). Communication might enforce norms or provide information. Peers provide social connections to other individuals, and older peers might in turn introduce adolescents to older partners. Meanwhile, an adolescent’s position within the overall structure of social ties (Ellen et al., 2001; Ali and Dwyer, 2011; Bramoulle et al., 2007; Manski, 1993). We included only those studies that had a cohort design and/or met higher quality in 6 out of the 10 criteria described in Table 1 to strike a balance between breadth of studies and quality of estimates.

We classified peer exposures as belonging to one of six types:

1. **Peer socio-demographic attributes**, such as age, gender, or in-school status. We hypothesised these could influence the behaviour of adolescents perhaps by influencing perceived norms about their behaviours, or they might affect whom an adolescent comes into contact with, potentially acting as social network bridges to influential people or situations.

2. **Perceived peer behaviours (descriptive norms)** could provide models of behaviour to be emulated, and are most often assessed by asking adolescents to indicate the number of their peers, classmates or friends who engage in particular behaviours.

3. **Peer approval (injunctive norms)** might cause adolescents to adapt their behaviour in a process similar to that involved with descriptive norms, but injunctive norms might or might not differ from the behaviours that adolescents perceive their friends to actually be engaged in.

4. **Peer communication** could play a role in diffusing information, perceived peer behaviours or norms, or provide a context in which adolescents could question or re-negotiate dominant norms.

5. **Peer connectedness**, or social and emotional support. This is sometimes measured as a count of relationships, a scale of their quality, or a score to indicate the degree to which an adolescent’s peers are connected to each other might influence behaviour. We include self-esteem in the domain of peer relationships to be in this category.

6. **Status and position within the network of peer relationships** could determine an adolescent’s exposure to information, resources and behaviours that might influence their behaviour. Additionally, given the normative pressures on behaviour, network position might reflect popularity and status amongst peers.

We did not conduct a formal meta-analysis due to study heterogeneity, but explored trends across findings by sub-groups, exposures and outcomes. We first considered statistical evidence for effects investigated (p < 0.05 was ‘good evidence’) and then further discuss these findings in the context of study design and possible biases.

**3. Results**

We screened 4512 abstracts (including duplicates) and 487 full papers, identifying 30 studies meeting the inclusion criteria, and 11 meeting quality appraisal criteria (Fig. 1). We dropped two studies (Rudatsikira et al., 2007; Siziya et al., 2008) because they analysed smaller subsets of the same data as a larger study (Peltzer, 2010), two studies because reported results were inconsistent in tables and text (Abedimeji et al., 2008; Negeri, 2014) and one because it
was unclear how the outcome variable was operationalized (Abebe et al., 2013). We then retained only those 11 studies meeting higher methodological quality criteria.

### 3.1. Study characteristics

The 11 included studies (Table 2) collected data between 2001
| Study, year published, country | Year data collected | Study sample size | Study population | Study design | Outcomes | Peer exposures types investigated | Number of peer exposure associations investigated |
|-------------------------------|--------------------|------------------|------------------|-------------|---------|----------------------------------|-----------------------------------------------|
| Kabiru et al., 2010, Kenya     | 2005–2006          | 2134             | Ages 12–19, girls and boys Slum and non-slum settlements, Nairobi. | Cohort, 12 months follow-up time. | Transition to first sex | Peer behaviours | 8 (male and female, two peer exposures, two age groups) |
| Lam et al., 2013, South Africa | 2002–2006          | 1491             | Ages 14–17, girls and boys who had never had sex of baseline. Subset of 14–22 year-olds participating in the Cape Area Panel Study. Two-stage probability sample, oversampling of White and African participants. | Cohort, 4 years follow-up time. | Transition to first sex; age difference with first sexual partner | Peer socio-demographic attributes | 4 (2 outcomes, male and female) |
| Kawai et al., 2008, Tanzania   | 2004–2005          | 2477             | 12–14 year-old girls and boys, never sexually active at baseline. Participants were part of a school-based RCT to prevent HIV. 24 schools were randomly selected from 108 in one of three districts in Dar es Salaam. | Cohort, 6 months follow-up time. | Transition to first sex | Peer behaviours, peer norms | 2 (two peer exposures) |
| Mkandawire et al., 2013, Malawi | 2009               | 1214             | Males and females aged 12–18 year-olds randomly selected from households enumerated in a population census in Mzuzu city, northern Malawi. | Time to event | Age at first sex | Peer connectedness | 2 (male and female) |
| Balabola et al., 2002, Rwanda  | 2001               | 1327             | Males and females aged 15–24 randomly selected from households from 4 Rwandan provinces using multi-stage sampling. | Cross-sectional | Sexual abstinence (ever sex), condom use at last sex | Peer approval norms | 3 (male and female, 2 peer exposures) |
| Brook et al., 2006, South Africa | 2001–2002          | 633              | 12–17 year-olds in recruited from households in Durban. Multi-stage sampling to be representative of ethnic and socioeconomic composition of city. | Cross-sectional | Risky sex (ever sex, multiple partners, condom use, sex while drunk/stoned) | Peer behaviours | 3 (male and female and combined gender analyses) |
| Cherie and Berhane, 2012, Ethiopia | Not reported     | 3840             | 15–24 year-old youth attending high school in Addis Ababa recruited using multi-stage sampling among city districts, schools and grade sections. | Cross-sectional | Ever anal sex, ever oral sex | Peer behaviours | 2 (2 outcomes) |
| Harrison et al., 2012, South Africa | 2003              | 983              | 14–17 year olds from rural Kwa-Zulu Natal recruited in preparation for a school-based HIV prevention. Participants selected by multi-stage sampling limited to areas in which an African Youth Alliance programme was delivered. | Cross-sectional | Ever sex, condom use at last sex | Peer behaviours | 6 (male and female, 2 outcomes, peer exposures by peer gender) |
| Kakoko, 2013, Tanzania         | Not reported       | 2820             | Students in primary schools from 22 randomly selected schools in Kinondoni | Cross-sectional | Ever sex | Peer approval norms | 1 |

(continued on next page)
| Study, year published, country | Number of peer exposure associations investigated | Peer exposures types investigated | Study design | Study population | Outcomes | Peer exposure types | Study sample size | Year data collected | Year published |
|-------------------------------|-----------------------------------------------|---------------------------------|-------------|-----------------|----------|-------------------|------------------|------------------|-----------------|
| McQuestion et al., 2012, Ghana | 4 (male and female, 2 outcomes) | Peer approval norms | Cross-sectional | Young women and men aged 17–22, The sampling frame consisted of the 2000 census and 2006 school census. | Peer connectedness | 3416 | 2006 | Not reported | 2012 |
| Wild et al., 2004, South Africa | 2 (male and female) | Peer connectedness | Cross-sectional | Students in Grades 8 and 11 from public high schools in Cape Town, South Africa were sampled by postal code area and grade. | Peer exposure types | 919 | 2004 | Not reported | 2004 |

Nine studies placed peer exposures within a theoretical framework: three studies (Cherie and Berhane, 2012; Kawai et al., 2008; McQuestion et al., 2012) used individual behavioural theories such as social cognitive theory or the Theory of Planned Behaviour to explain adolescent sexual behaviour, four used ecological frameworks, two used concepts of ‘risks clustering’, one cited a ‘protection-risk’ and one drew on a social networks or contagion theoretical framework (Lam et al., 2013).

Perceived peer behaviour (descriptive norms) was incorporated into a variety of theoretical frameworks. In three studies, the peer behaviour matched the outcome of interest (Cherie and Berhane, 2012; Kawai et al., 2008; McQuestion et al., 2012), while in two studies composite measures of peer behaviours were developed and employed in a ‘protection-risk framework’ (Kabiru et al., 2010) and as mediators of more distal socioeconomic factors (Brook et al., 2006). Peer approval norm exposures played a similar role as descriptive norms (Kawai et al., 2008; McQuestion et al., 2012). Classmate age, the only peer attribute exposure examined, was viewed as determining the normative influence that adolescents would be exposed to, as older peers would be more likely to have had sex (Lam et al., 2013). Peer connectedness was considered to be a facet of social support in one study without a named theoretical framework (Lam et al., 2013) and similarly peer self-esteem, which was seen as a trait giving rise to clustered risk behaviours including risky sex (Wild et al., 2004).

We next turn our attention to the findings of each of the selected studies, reported in Table 3 and organised first by sexual behaviour outcome and secondly by type of peer exposure.

### 3.2. Sexual debut

Studies investigating sexual debut used transition to first sex when longitudinally designed (Kabiru et al., 2010; Kawai et al., 2008; Lam et al., 2013), time to first sex in the case of a time-to-event study (Mkandawire et al., 2013) and otherwise ever having had sex (Harrison et al., 2012; Kakoko, 2013; McQuestion et al., 2012) or sexual abstinence (Balabola et al., 2002), and one study investigated ever having had oral sex or anal sex (Cherie and Berhane, 2012).

There was good evidence for an effect of estimated age of classmates, classified as a peer socio-demographic attribute exposure, on transition to first sex among young women in a cohort study in urban South Africa: young women were 13.8% more likely to transition for each additional year or exposure (p < 0.05, Lam et al., 2013). However, there was little evidence for effect seen among young men in the same study. This was the only study examining this peer exposure.
| Study                        | Study design | Outcome                      | Exposure type | Exposure                                                                 | Other factors adjusted for                                                                 | Gender | Age in years at baseline | Analysis sample size | Estimate of peer exposure |
|-----------------------------|--------------|-------------------------------|---------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------|--------------------------|------------------------|----------------------------|
| **Sexual debut**            |              |                               |               |                                                                          |                                                                                           |        |                          |                         |                            |
| Lam et al., South Africa    | Cohort       | Transition to first sex      | PA            | Estimated cumulative exposure to peers 2 + years older in school since age 12. (Cumulative exposure is equal to 1.0 if there was a 25% increase in the number of classmates 2 + years older each year for 4 years, or of 50% for 2 years, for example). | Quadratic age of participants in months, enrolled in school in 2002, grade enrolled in 2002, mother's and father's education, race, living with mother/father in 2002, household income, number of months between follow-up interviews, literacy/numeracy test score. | Female | 14–17                    | 808                     | 13.8% more likely to have had sexual debut during follow-up for each 1.0 cumulative exposure to classmate peers aged 2 + years older since age 12, p < 0.05 |
| Kabiru et al., Kenya         | Cohort       | Transition to first sex      | PB            | Proportion of peers engaging in unconventional behaviour (sex, substances, trouble with police, run away from home) at baseline. | Slum residence, school enrolment, number of adolescents in household, perceived parental modelling, peer models for conventional behaviour, whether had non-penetrative sexual contact, delinquent behaviour, substance use. | Female | 12–15                    | 357                     | aOR 0.9, 95% CI 0.7–1.1 |
|                            |              |                               | PB            |                                                                          |                                                                                           | Male   | 12–15                    | 336                     | aOR 1.8, 95% CI 1.1–2.8 |
|                            |              |                               | PB            |                                                                          |                                                                                           |        | 16–19                    | 93                      | aOR 0.8, 95% CI 0.5–1.2 |
|                            |              |                               | PB            |                                                                          |                                                                                           |        | 12–15                    | 336                     | aOR 1.2, 95% CI 0.8–1.6 |
|                            |              |                               | PB            |                                                                          |                                                                                           |        | 16–19                    | 94                      |                            |
|                            |              |                               | PB            |                                                                          |                                                                                           |        |                          |                         |                            |
| Kawai et al., Tanzania      | Cohort       | Transition to first sex      | PB            | Perceived prevalence of students in their age group who had ever had sex. 6 point scale, measured at baseline. | Age, gender, living with mother, have a boyfriend/girlfriend, alcohol use, attitudes towards delayed sex, intention to have sex. | Both   | 12–14                    | 2477                    | High (5–6 points) compared to low (1–2 points): aOR 1.99, 95% CI 1.3–3.06 Moderate (3–4 points) to low (1–2 points): |

(continued on next page)
| Study                          | Study design | Outcome            | Exposure                          | Other factors adjusted for                                                                 | Gender | Age in years at baseline | Analysis sample size | Estimate of peer exposure |
|-------------------------------|--------------|--------------------|-----------------------------------|------------------------------------------------------------------------------------------|--------|--------------------------|----------------------|--------------------------|
| Harrison et al., South Africa | Cross-sectional | Ever sex          | PB | Perception of proportion of same sex peers that have had sex: "Of the girls/boys that you know, how many do you think have had sex?" Measured lower/higher. | Female | 14–17                  | 449                  | aOR = 1.31, 95% CI 0.83–2.08. Test for trend p = 0.002 |
|                               |              |                    | PB | Not included in adjusted model because p > 0.10 for bivariate model Age, participant’s gender norms and values. | Male   | 14–17                  | 329                  | aOR = 1.48, 95% CI (1.05–2.03) |
|                               |              |                    | PB | As above for opposite sex peers. | Female | 14–17                  | 449                  | Not shown (not found to be statistically significant) |
| Cherie et al., Ethiopia       | Cross-sectional | Ever anal sex     | PB | Perception that best friend has had anal sex. | Both   | 15–24                  | 3543                 | aOR = 9.7, 95% CI 5.4–17.7 |
|                               |              |                    | PB | Perception that best friend has had oral sex. | Both   | 15–24                  | 3543                 | aOR = 5.7, 95% CI 2.6–11.2 |
| Balabola et al., Rwanda       | Cross-sectional | Sexual abstinence | PB | Perception that most friends are having sex | Female | 15–24                  | 533                  | aOR = 0.30, p < 0.001 aOR = 0.37, p < 0.001 |
|                               |              |                    | PB | Age, religion, urban/rural residence, whether live with father, school enrolment, alcohol use, perceived self-efficacy to refuse sex, self-esteem, beliefs about pre-marital sex, perceived social support for abstinence (non-peer). | Male   | 15–24                  | 790                  |                           |
| Kawai et al., Tanzania        | Cohort       | Transition to first sex | PAN | Favourable social norms about delayed sex, e.g. 'Most friends perceive that one should be older to have sex'? 0–6 point scale, more favourable has higher score. Measured at baseline. | Both   | 12–14                  | 2477                 |                           |
|                               |              |                    | PAN | Univariate analysis only presented. | Both   | 12–14                  | 2658                 |                           |
McQuestion et al., Ghana
Cross-sectional Ever sex PAN
Permissive attitudes about sex: Three Likert-scaled statements formed the best additive scale for perceived peer attitudes toward sex (perceived peer norms): “Most of my friends believe it is OK to have sex with a steady girlfriend or boyfriend”; “Most of my friends believe it is OK to have sex with more than one partner in one month”; “Most of my friends believe that one should have regular sex to avoid health problems”.
Age, ethnic group, household wealth, father's occupation, parents married, ever worked for a wage, attends church weekly, reproductive knowledge, home sex communication, adult support, interactions between adults support and knowledge and between knowledge and home sex communication
Female 17–22 1484
Male 17–22 1396

Cross-sectional Age at first sex in years PAN
Cross-sectional Age at first sex in years PAN

Mkandawire et al., Malawi
Time to event Time to first sex PC
Number of close friends: 1, 2–5, >5
Orphan status, knowledge and myths about HIV, food security, has close relatives, sibling residence, school enrolment, household structure.
Female 12–18 641
Male 12–18 573

Condom use Balabola et al., Rwanda
Cross-sectional Condom use at last sex PAN
Best friend approves of condom use
Age group, gender, education, religion, urban/rural residence, type of sexual relationship, lives with father, perceived self-efficacy, advocacy and knowledge for
Both 15–24 474
aOR = 1.62, p > 0.1

(continued on next page)

disagree that will lose friends if do not have sex
aOR = 0.98, p < 0.05 for unit score increase in peer permissive attitudes to sex scale
aOR = 0.99, p < 0.05 for one unit score increase in peer permissive attitudes to sex scale
Increase of 0.014 years on age at first sex for unit increase in permissive peer attitudes towards sex scale, p < 0.05
Not shown (not found to be statistically significant)
| Study | Study design | Outcome | Exposure type | Exposure | Other factors adjusted for | Gender | Age in years at baseline | Analysis sample size | Estimate of peer exposure |
|-------|--------------|---------|---------------|----------|---------------------------|-------|--------------------------|----------------------|---------------------------|
| Harrison et al., South Africa | Cross-sectional | Condom use at last sex | PB | Perception that male peers are using condoms (lower/higher) | Not included in adjusted model because \( p > 0.10 \) for bivariate model | Female | 14–17 | 59 | not given |
| | | | PB | Age, participant condom attitudes and perceptions. | | | | | |
| Risky sex, composite variables | Cross-sectional | Risky sex: ever sex, multiple partners, condom use, sex while drunk/stoned | PB | Peer deviancy (latent variable combining alcohol, drug use, and perceived sexual behaviours) | Structural equation model: age and latent variables for family poverty, parent/child relationship, and vulnerable personality traits. | Both | 12–17 | 633 | Parameter estimate = 0.49, \( p < 0.001 \) Parameter estimate = 0.10, \( p < 0.001 \) Parameter estimate = 0.24, \( p < 0.001 \) Parameter estimate = 0.25 for scoring above the median peer self-esteem score, 95% CI 0.12–0.52, \( p < 0.001 \) Parameter estimate = 0.54 for scoring above the median peer self-esteem score, 95% CI 0.54–2.01 |
| Brook et al., South Africa | | | PB | Peer self-esteem sub-scale (Likert responses to statements such as ‘I am as popular with kids my own age as I want to be’), 6 point scale. | Grade, race, other self-esteem indices (school, family, body, sports, global self-esteem). | Female | Grades 8-11 | 448 | aOR 0.25, 95% CI 0.12–0.52, \( p < 0.001 \) |
| Wild et al., South Africa | | | PC | Peer self-esteem sub-scale (Likert responses to statements such as ‘I am as popular with kids my own age as I want to be’), 6 point scale. | | Male | Grades 8-11 | 333 | aOR 0.54, 95% CI 0.54–2.01 |
| Age difference with first sexual partner | Cross-sectional | Linear regression | PA | As Lam et al. above. | As Lam et al. above. | Female | 14–17 | 348 | Partner was 0.87 years older than participant for each cumulative exposure of 1.0, \( p = 0.06 \) Partner was 0.06 years older than participant for each cumulative exposure of 1.0, \( p > 0.05 \) |

Findings by gender include all those reported by the studies, whether stratified by male/female and or combined.

Peer exposure types: PA — peer socio-demographic attributes, PB — peer behaviour, PAN — peer approval norms, PC — peer connectedness.
Findings were mixed as to whether perceived peer behaviours were associated with ever having had sex (or conversely, sexual abstinence). One study pooling young men and women found large effects for perceiving that best friends had engaged in oral sex (adjusted OR = 5.7, 95% CI 3.6–11.2) or anal sex (aOR = 9.7, 95% CI 5.4–17.7) on participant’s corresponding behaviours (Cherie and Berhane, 2012). Another similarly found strong negative associations between sexual abstinence and perceiving most friends to have had sex for both genders (aOR = 0.30 for young women and 0.37 for young men, both p < 0.001, Balabola et al., 2002). A smaller but still statistically strong effect was found in a cohort examining the perception at baseline that a high compared to low proportion of friends were sexually active on transition to first sex (aOR = 1.99 for young men and women together, 95% CI 1.30—3.06), (Kawai et al., 2008). On the other hand, another study found a similar effect only among boys (Harrison et al., 2012), and a second cohort study only among one age/gender/residence subgroup of many examined (Kabiru et al., 2010).

Among studies that examined associations between peer approval norms and ever having had sex, evidence was again inconsistent. One study found an aOR of 0.85, 95% CI 0.58—1.23 for favourable peer norms towards delayed sex on transition to first sex over the study period (Kawai et al., 2008), and another found that participants had 1.7 times the odds of reporting ever having had sex if they thought they would lose friends if they did not have sex compared to those who disagreed with this statement, (Kakoko, 2013; McQuestion et al., 2012). However, another study found a small but statistically significant effect of peer norms on reported ever sex, whereby participants actually had reduced odds (aOR 0.95, p < 0.001) of reporting sex for every additional unit score increase in permissive peer sexual attitudes (McQuestion et al., 2012). In fact, McQuestion et al. was the only study to have found that reported participant sexual behaviour was discordant with perceived peer behaviour or the behaviour favoured by peers, that is, participants engaged in behaviour opposite to what peers approved of.

There was little evidence that peer connectedness, here operationalized as number of close friends (Mkandawire et al., 2013), was associated with ever having had sex, though only one study examine this outcome-peer exposure combination.

### 3.3. Age of first sexual partner

There was evidence from one study for an association between peer socio-demographic attributes and age of first sexual partner. Among girls, but not boys, there was somewhat weak evidence that each additional year’s estimated exposure to older classmates was associated with 0.87 years increased age of the first reported sexual partner, p = 0.06 (Lam et al., 2013). No other studies were found that investigated this outcome.

### 3.4. Condom use

Two studies investigated reported condom use as an outcome. One investigated peer approval norms and found little evidence for an effect on condom use at last sex (Balabola et al., 2002), and the other found that perceiving a higher number of male peers to have had sex increased the odds of participant condom use at last sex among boys (aOR 1.79, 95% CI 1.22—2.59) but not among girls (effect measure not given, Harrison et al., 2012).

### 3.5. Combined sexual behaviour outcomes

There were two studies that examined whether peer exposures were associated with a combined ‘risky’ sexual behaviour variable, composed variously of ever having had sex, sex with multiple partners, sex while drunk/high and length of time sexual partners were known before intercourse. There was strong evidence form a study in urban South Africa that a combined peer behaviour exposure was associated with risky sex in both boys and girls and in a combined gender analysis (Brook et al., 2006). Another study from South Africa found a strong association between risky sex and peer self-esteem, classified as peer connectedness, but only among girls (aOR 0.25 for scoring above the median self-esteem score, 95% CI 0.12—0.52, Wild et al., 2004).

### 3.6. Summary of findings

Overall, findings as to the evidence for an association between peer exposures and sexual behaviour among young people in sub-Saharan Africa were inconsistent, Table 4. We examined findings to investigate patterns by outcome type, peer exposure type, gender,
and age, and did not find clear patterns for the conditions in which peer exposures might be more or less effective.

Sexual debut outcomes were the most commonly studied, but their findings were heterogeneous. Within each outcome category, there was mixed evidence as to their associations with a peer exposure. Nor did considering the findings by type of peer exposure illuminate a clear pattern as to whether one type showed greater evidence for influence on sexual behaviour than another. There was more research investigating perceived peer behaviours, but across and within outcomes the findings as to its influence were inconsistent. There were also mixed results for associations between sexual behaviours and peer approval norms and peer connectedness. Only one study examined peer socio-demographic attributes (Lam et al., 2013) and found evidence for effects on transition to first sex among girls but not boys.

By gender, there were again differences across studies and it was not clear that peer exposures were more or less salient for either boys or girls. Nor did there appear to be a pattern by the age of participants.

4. Discussion

Many observational studies have explored the association between peer exposures and adolescent sexual behaviours in Sub-Saharan Africa, driven by a range of different theoretical perspectives. Each of the eleven higher quality included studies found evidence for at least one association between a peer exposure and sexual behaviour outcome in at least one combination of outcome, peer exposure type and gender. However, including all findings reported in the studies, there were mixed results. We did not discern patterns by outcome or peer exposure types, nor by gender or age. There was a high level of heterogeneity in the peer exposures examined and the means by which the same constructs were operationalized. It is therefore difficult to draw strong conclusions overall on the association between peer exposures and adolescent sexual behaviour.

4.1. Strengths and limitations of the review

This review is the first collation of the quantitative evidence for peer influences on adolescent sexual behaviour in Sub-Saharan Africa. We have dealt with the heterogeneity of peer influences studied by classifying different types of peer exposures and examining how they have fit into the theoretical frameworks employed by studies.

Our review has not included non-peer reviewed literature or articles published in a language other than English. Using a cut-off for methodological quality could imply that all criterion carry equal weight and some studies may have been misclassified as regards their overall quality.

4.2. Strengths and limitations in the evidence base

In our review, 30 studies were found before exclusions for inconsistencies between text and tables and only 11 retained for higher quality, Fig. 1. Many studies did not focus only on peer exposures but examined a range of factors theorised to influence sexual behaviour. Studies employed different variables and adjustment strategies, which made comparing effects of peer exposures across studies difficult, including strength of effect. Over-adjustment, whereby factors on a causal pathway between a peer exposure and outcome are adjusted for, was a potential problem. If such mediation was present, the effect of the peer exposures would likely have been under-estimated (Victora et al., 1997).

The strongest available evidence came from three cohort studies, which were better able to distinguish possible influence from peers from reverse causality, such as the selection of peers based on an established sexual behaviour. However, their results still were not uniform. One study included many sub-group analyses but found statistical evidence for an association in only one (Kabiru et al., 2010). Attribution of selection effects as influence, whereby friends are chosen on the basis of behaviour, has been found to inflate estimates of peer influence on adolescent sexual behaviour in other populations (Go et al., 2010; Mercken et al., 2012). The other studies, which measure peer exposures and sexual behaviours at the same point in time, would have been prone to this problem.

No studies used a biologically measured outcome of sexual behaviour. Self-reported sexual behaviour is subject to social desirability and recall biases, especially in adolescents (Buve et al., 2001; Cowan et al., 2002). There is evidence from other populations that study participants tend to estimate peer behaviour as being more like their own, which could bias the evidence for associations upwards (Iannotti and Bush, 1992).

While the majority of included studies did include a theoretical framework in which to situate the role of peers, the heterogeneity of findings makes it difficult to comment on the relative validity of frameworks for adolescents in Sub-Saharan Africa.

Most studies asked participants to describe peers in general, rather than collecting data about specific individuals. This meant that there was little information about peer socio-demographic characteristics, and made controlling for a shared environment difficult. Information about what neighbourhood a peer resides in or what school they attend allows researchers to control for factors at these levels that could affect the behaviour of both participants and their friends (Ali and Dwyer, 2011). Data about specific relationships can also be used to investigate the evidence for a dose–response relationship by relationships strength (Sieving et al., 2006), one of the classic epidemiological indicators of a causal relationship (Bradford Hill, 1965). Additionally, while a cross-sectional design still presents problems for causal understanding, knowing something about the duration of the relationship versus the initiation of behaviour can help in determining whether influence or selection is most likely.

5. Conclusions

The quantitative evidence for an effect of peer exposures on adolescent sexual behaviour in sub-Saharan Africa is inconclusive. While we found some evidence supporting the role of peers influencing sexual behaviours of adolescents, and peers are reported to be important to romantic and sexual behaviour in qualitative studies (Gevers et al., 2012; Harrison, 2008; MacPhail and Campbell, 2001; Selikow et al., 2009), there are significant gaps in our current understanding. Future research should investigate biological, non-self-reported sexual behaviour outcomes, and we suggest that approaches such as social network analysis, which collects information about specific peers and their inter-relationships, could be a useful way forward.

Acknowledgements

Elizabeth Fearon was supported by a Bloomsbury Colleges/London International Development Centre PhD studentship.

The London School of Hygiene and Tropical Medicine provided funding for Gold Open Access publishing.
Appendix 1. Literature search terms

(adolescen* OR youth* OR young people OR young person* OR teen* OR young women OR young men).

AND

(sex* OR virgin* OR condom* OR HIV* OR AIDS or human immuno-deficiency virus* OR acquired immune deficiency syndrome OR STI OR STD OR pregnant*).

AND

(peer* OR friend* OR social influence).

AND

(Africa* OR Cape Town OR Johannesburg OR Durban OR Zimbabwe OR Zambia OR Botswana OR Swaziland OR Lesotho OR Mozambique OR Namibia OR Kenya OR Tanzania OR Uganda OR Nigeria OR Ghana OR Malawi OR Angola OR DRC OR Congo* OR Rwanda* OR Burundi* OR Cameroon* OR Gambia* OR Senegal* OR Ethiopia* OR Somalia* OR Gabon* OR Guinea* OR Togo* OR Benin* OR Burkina* OR Liberia* OR Cote* OR ivory coast OR sierra OR Eritrea* OR Mali* OR Chad* OR Sudan* OR Niger* OR Central African Republic OR Madagascar*)

References

Abbe, M., Tison, A., Netsanet, F., 2013. Living with parents and risky sexual behaviors among preparatory school students in Jimma zone, South west Ethiopia. Afr. Health Sci. 13, 498–506.

Adedimeji, A.A., Heard, N.J., Odutolu, O., Omololu, F.O., 2008. Social factors, social condom and condom use behavior among young urban slum inhabitants in southwest Nigeria. Afr. J. Public Health 5, 215–222.

Ali, M.M., Dwyer, D.S., 2011. Estimating peer effects in sexual behavior among adolescents. J. Adolesc. 34, 183–190.

Alloway, R., Bebbington, P., 1987. The buffer theory of social support—a review of the literature. Psychol. Med. 17, 91–108.

Anglin, R.E., Samaan, Z., Walter, S.D., McDonald, S.D., 2013. Vitamin D deficiency and depression in adults: systematic review and meta-analysis. Br. J. Psychiatry 202, 100–107.

Balabola, S., Awasum, D., Quennum-Renaud, B., 2002. The correlates of safe sex practices amongst Rwandan youth: a positive deviance approach. Afr. J. AIDS Res. 1, 11–21.

Barker, G., 2007. Adolescents, Social Support and Help-seeking Behaviour: An International Literature Review and Programme Consultation with Recommendations for Action: An International Literature Review and Programme Consultation with Recommendations for Action, WHO Discussion Papers on Adolescence. Department of Child and Adolescent Health and Development, World Health Organization.

Berndt, T.J., 1979. Developmental changes in conformity to peers and parents. Dev. Psychol. 15, 608–616.

Billy, J.O., Udry, J.R., 1985. The influence of male and female best friends on adolescent sexual behavior. Adolescence 20, 21–32.

Bradford Hill, A., 1965. The environment and disease: association or causation? Proc. R. Soc. Med. 58, 260–260.

Bramoulle, Y., Djebbari, H., Fortin, B., 2007. Identification of Peer Effects Through Social Networks. University of Laval Working Paper.

Brook, D.W., Morojele, N.K., Zhang, C., Brook, J.S., 2006. South African adolescents: pathway to risky sexual behavior. Aids Educ. Prev. 18, 259–272.

Buhi, E.R., Goodson, P., 2007. Perceived vs actual friends use of alcohol, cigarettes, marijuana, and cocaine—which has the most influence. J. Youth Adolesc. 21, 375–389.

Kabiru, C.W., Beguy, D., Undie, C.-C., Zulu, E.M., Ezeh, A.C., 2010. Transition into first sex among adolescents in slum and non-slum communities in Nairobi, Kenya. J. Youth Stud. 13, 453–471.

Kakoko, D.C., 2013. Reported heterosexual intercourse and related behaviours among primary school pupils in Kinondoni district, Dar es Salaam, Tanzania. Cult. Health Sex. 15, 235–245.

Kawai, K., Kaaya, S.F., Kajula, J., Mbwanjo, G., Kilonzo, N.G., Fawzi, W.W., 2008. Parents’ and teachers’ communication about sex and HIV in relation to the timing of sexual initiation among young adolescents in Tanzania. Scand. J. Public Health 36, 879–888.

Kelly, R.J., Gray, R.H., Sewankambo, N.K., Serwadda, D., Wabwire-Mangen, F., Lutalo, T., et al., 2003. Age differences in sexual patterns and risk of HIV infection in rural Uganda. J. Acquir. Immune Defic. Syndr. 32, 446–451.

Lam, D., Maretelo, L.J., Ranchod, V., 2013. The influence of older classmates on adolescent sexual behavior in Cape Town, South Africa. Stud. Fam. Plan. 44, 147–167.

MacPhail, C., Campbell, C., 2001. ‘I think condoms are good but aai, i hate those things’: condom use among adolescents and young people in a Southern African townships. Soc. Sci. Med. 52, 1613–1627.

Manski, C.F., 1993. Identification of endogenous social effects: the reflection problem. Rev. Econ. Stud. 60, 531–542.

Markham, C.M., Lormand, D., Gliopen, K.M., Peskin, M.F., Flores, B., Low, B., et al., 2010. Connectedness as a predictor of sexual and reproductive health outcomes for youth. J. Adolesc. Health 46, 523–541.

Matsui-Tyndale, E., Barnett, J.P., 2010. Peer-led interventions to reduce HIV risk of youth: a review. Eval. Progr. Plan. 33, 98–112.

McQuestion, M., Ahadece, C., Posner, J., Williams, T., 2012. Psychosocial processes and sexual initiation among Ghanian youth. Health Educ. Behav. 39, 268–275.

Medley, G., Keat, M., O’Reilly, J., 2009. Effectiveness of peer education interventions for HIV prevention in developing countries: a systematic review and meta-analysis. AIDS Educ. Prev. 21, 201–206.

Mercken, L., Steglich, C., Sinclair, P., Holliday, J., Moore, L., 2012. A longitudinal social network analysis of peer influence, peer selection, and smoking behavior among adolescents in British schools. Health Psychol. 31, 450–459.

Mkandawire, P., Tenkorang, E., Luginaah, I., Ntim, L., 2013. Orphan status and time to first sex among adolescents in Northern Malawi. AIDS Behav. 17, 939–950.

Mohr, D., Liberati, A., Terrafylli, J., Altman, D.G., 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. J. Clin. Epidemiol. 62, 1006–1012.

Moody, J., 2009. Network Structure and Diffusion. Duke Population Research Institute Online Working Papers Series.

Negers, E.L., 2014. Assessment of risky sexual behaviors and risk perception among youths in Western Ethiopia: the influences of family and peers: a comparative cross-sectional study. BMC Public Health 14, 301.

Petrie, K., 2010. Early sexual debut and associated factors among in-school adolescents in eight African countries. Acta Paediatr. 99, 1242–1247.

Pettifor, A.E., Rees, H.V., Kleinschmidt, I., Steffenson, A.E., MacPhail, C., Hlongwa-Modiokile, L., et al., 2005. Young people’s sexual health in South Africa: HIV prevalence and sexual behaviors from a nationally representative household survey. AIDS 19, 1525–1534.

Prieinstein, M.J., Meade, C.S., Cohen, G.L., 2003. Adolescent oral sex, peer popularity, and perceptions of best friends’ sexual behavior. J. Pediatr. Psychol. 28, 243–249.

Rudatsikira, E., Ogwell, A.E.O., Siyiza, S., Muula, A.S., 2007. Prevalence of sexual intercourse among school-going adolescents in Coast Province, Kenya. Tana. Med. J. Res. Bull. 9, 109–116.

Selikow, T.-A., Ahmed, N., Flisher, A.J., Mathews, C., Mukoma, W., 2009. I am not “umwanyiyo”: a qualitative study of peer pressure and sexual risk behaviour among young adolescents in Cape Town, South Africa. Scand. J. Public Health 37, 107–112.

Sieving, R.E., Eisenberg, M.E., Pettingell, S., Skay, C., 2006. Friends’ influence on adolescents’ first sexual intercourse. Perspect. Sex. Reprod. Health 38, 13–19.

Siyiza, S., Muula, A.S., Kazembe, L.N., Rudatsikira, E., 2008. Harmful lifestyles clusters among school adolescents in Zambia. BMC Pediatr. 8, 1903.

Steinberg, L., Monahan, K.C., 2007. Age differences in resistance to peer influence. J. Youth Adolesc. 21, 1543.

Stenberg, H., Kalra, N., Jacobi, J., Watts, C., 2013. Is early sexual debut a risk factor for HIV infection among women in sub-Saharan Africa? A systematic review. Am. J. Reprod. Immunol. 69 (Suppl. 1), 27–40.

UNAIDS, 2014. The Gap Report. UNAIDS, Geneva.

Valente, T.W., 1995. Network Models of the Diffusion of Innovations. Hampton Press.
Victora, C.G., Huttly, S.R., Fuchs, S.C., Olinto, M.T., 1997. The role of conceptual frameworks in epidemiological analysis: a hierarchical approach. Int. J. Epidemiol. 26, 224–227.

Wand, H., Ramjee, G., 2012. The relationship between age of coital debut and HIV seroprevalence among women in Durban, South Africa: a cohort study. BMJ Open 2, e000285.

Wells, G.A., Shea, B., O’Connell, D., Peterson, J., Welch, V., Losos, M., et al. The Newcastle–Ottawa Scale (NOS) for assessing the quality if nonrandomized studies in meta-analyses, Available from http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp [accessed 14.10.15.].

Wild, L.G., Flisher, A.J., Bhana, A., Lombard, C., 2004. Associations among adolescent risk behaviours and self-esteem in six domains. J. Child Psychol. Psychiatry 45, 1454–1467.