Author's response to reviews

Title: Female sex work and international sport events - no major changes in demand or supply of paid sex during the 2010 Soccer World Cup: a cross-sectional study

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Author's response to reviews: see over
Dear Editor,

Thank you for the reviews and the constructive comments on our manuscript "Sex work and international sporting events – impact of the 2010 FIFA World Cup (TM) on female sex work in South Africa" (Manuscript reference number: 6797772337043683), now entitled “Female sex work and international sport events – no major changes in demand or supply of paid sex during the 2010 Soccer World Cup: a cross-sectional study”

As per your suggestion, we have addressed each of the three reviewers’ comments point-by-point. We have amended our manuscript accordingly, and changes are indicated in yellow highlight in the document.

The reviewers’ suggestions have been very useful and we believe that the manuscript has been strengthened by the changes suggested by the reviewers. We hope that it is suitable for publication in **BMC Public Health**.

Please find below our detailed responses.
Yours sincerely

Marlise Richter
Reviewer: Diane Cooper

Reviewer's report:

Overall comment

This is a very interesting article on a neglected topic. It is on a novel area, taking into account the World Cup in South Africa and its impact on Sex work. It is also interesting that it takes into account different regions, including urban and rural. The language in the paper is clearly and well written and the manuscript adheres to the relevant standards for reporting and data deposition.

Specific comments:

Title and abstract

The title accurately conveys what the study, its findings and its discussion/conclusion.

Background

The background information is well covered.

Methods

These are well-described – the interview selection and training (very important in this case); ethics; study measures and statistical analysis.

Results

The results are clear and well-presented.

Page 8, paragraph 3, lines 2 & 3: While a third is a minority, it is still a substantial minority that perhaps should be commented on.

Response

Thank you – this is an important point. We comment on police contact and its impact in the Discussion Section (page 9), and have now included the following additional sentences highlighted in yellow below:
Findings on police contact and high proportions of negative experiences are consistent with other studies that report frequent harassment and sex worker human rights violations by police in South Africa, [39, 40, 52, 53] as elsewhere on the continent. [54, 55] These experiences compound the marginalisation of this group, [56, 57] and impact adversely on health. For example, studies in South Africa note police confiscation of condoms from sex workers as ‘evidence’ that commercial sex had taken place [38, 58], while recent reports from Cape Town describe police harassment of outreach teams engaged in health promotion and HIV education with sex workers. [59, 60]. Police rape of sex workers has also been widely documented. [38, 39] A 28-year respondent in Johannesburg in our study recounted: “I remember when they [the police] arrested me in my hotel for loitering and they find me while I was sleeping and they rape me first before they arrest me”.

Discussion

The main issue emerging are clearly and critically presented. This is an interesting contrast with India on page 9, regarding contact with peer educators – indeed very low in this study in South Africa and needs address as the authors correctly point out.

1. Page 9, line 6: reference here to girls should be deleted as the study only included women 18 years+

Response

This is an excellent point. We have removed the reference to girls and the paragraph now reads as follows:

- Similarly, the proportion of sex workers in the study samples who were below 24 years remained relatively constant throughout the research period.

The limitations are excellently dealt with. They answered all the issues, I would have raised.

The recommendations in the last paragraph of the discussion are very important.
Reviewer: Kathleen Deering

Reviewer’s report:

General comments

The authors have submitted a very interesting study that addresses an important gap in research and policy regarding the potential impact of large-scale sporting events on sex work. The paper is well researched and well written and provides important interpretations and recommendations for future events. While in general I recommend that this paper be published, I do have some comments, suggestions and concerns regarding the study design, interpretation and analysis. These are detailed in the following categories and numbers.

Discretionary Revisions (which are recommendations for improvement but which the author can choose to ignore)

1. Formatting of headings of sections should be modified for clarity – i.e., the heading should have a certain format, with sub-headings having a different format (right now they are all bolded and indented).

Response

This has now been remedied. All main headings are in bold and point 13 font, while sub-headings are indented, italicised and formatted in font size 12.

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

2. In the Results section, please make sure to describe ‘results not shown’ in a bit more detail: say ‘There were no statistically significant changes in …’ (Results, line 6) if this is true, and provide the p-values.

Response:

We have remedied this by adding more detail in the following way:

- All the data not shown phrases have been removed except for one instance on page 8 which reads as follows:
Similar findings were obtained when data was stratified according to city, while no significant interaction was observed within cities in supply or demand (data not shown).

Under the heading Working conditions and health service utilization, we added the following: “Only a third of participants (322/1046) reported that the sex industry was altered by the World Cup (94 noting a negative change, 222 a positive change and 6 had mixed experiences).”

We have now expanded the data in Table 1 to include socio-demographic characteristics for all three time periods, and described these in the manuscript.

- Please refer to our response to Reviewer 3, point 11 below that sets out our original rationale for providing baseline information only.

3. Results section: Are the continuous variables normally distributed? The methods section, last sentence, implies not. In this case I recommend reporting the medians and interquartile ranges rather than (or in addition to) the means.

Response:

We overlooked mentioning the Student’s t test in the Methodology. This has been remedied and it now reads as follows:

- Chi-square tests were used to detect differences between categorical variables.

  For continuous variables that had a normal distribution we used the Student’s t test and Anova test (for comparing means from three groups), while the Mann-Whitney U test was used for comparing data with a non-normal distribution.

4. Results, Working conditions and health care utilization: Please clarify in the first sentence of this section that you are now talking about qualitative results. Otherwise the change in reporting language (i.e., how you report results) seems quite out of place. Sentence beginning with “This stands in contrast...” is awkward – please revise.

Response:

- The Study measures and statistical analysis section has now been changed to highlight that the changes to the sex industry during the World Cup had a quantitative and qualitative component:
Participants during and after the World Cup were asked whether the event had led to changes in the sex work industry, and if so, to describe such changes in an open-ended question. Researchers coded these free-text responses as “negative” (more competition, less clients, less income, or increased police harassment); “positive” (more foreign currency, more business, could charge more, or improved relationship with police); or “mixed experiences”, both positive and negative. Finally, in the surveys during and after the World Cup, participants were asked whether they had previously completed a similar survey.

The section in which the sentence starting with “this stands in contrast” has been reworded to the following:

Only a third of participants (322/1046) reported that the sex industry had been altered by the World Cup (94 noting a negative change, 222 a positive change, 6 had mixed experiences). Descriptive analysis of qualitative data on these changes is presented in Table 3. In their free-text responses, a few reported observing a larger number of sex workers, while others remarked on an increase in the business and income earned. Most, however, had experienced the contrary, and noted the adverse impact of the cold weather and of supporters’ absorption with soccer matches on demand for sex work. Some said that working conditions had improved with the World Cup, such as refurbishments to the hotels where they worked and more assistance from peer educators.

5. Suggest re-phrasing ‘being drunk with clients’ to ‘using alcohol with clients’ or ‘heavy use of alcohol with clients’ in all cases.

Response:

The phrasing used in the paper is based on the wording of the survey, that asked “With your last client, did you feel drunk during the sex?”. It thus signifies the subjective experience of the sex worker during last sex, and is not based on the amount of alcohol consumed. We have amended the Study Measures section to reflect this, by including the following:
To measure whether the World Cup impacted on sexual risk behaviour by sex workers, we contrasted unprotected sexual intercourse with last client, as well as whether sex workers perceived themselves to have “felt drunk” during sex with last client.

- Also, to address the reviewer’s concerns, in the revised paper we have included data from the study measure which assessed the amount of alcohol consumed (in the past month, having had 5 or more drinks every day or almost every day).

6. Does Table 4 show researcher–summarized results from the qualitative reporting? If so, please clarify with sentences in the Results section: “Table 3 shows….” And “Table 4 shows…” This could actually be helpful for Table 1 too. You do say something like this for Table 2 already.

Response:

- Table 3 contains an extract of direct quotes from participants, while Table 4 summarises the coded responses of open-ended questions on police interaction and health care contact. The footnotes to Table 4 now make this explicit, we added the following notes:
  - Coded from free-text descriptions that participants provided about police contact in the preceding month;
  - *Coded from free-text descriptions that participants provided about their most recent health care experience
- The Methods section reads as follows:
  - Health services contact with sex workers during the three phases was compared to assess whether there was an increase in coverage of services during the World Cup. Participants described their most recent interaction with health care in open-ended questions, which researchers classified according to type of service received. Similarly, participants were asked about contact with the police in the preceding month to assess any changes in law enforcement within the sex industry. Free text answers to police interaction in the last month were coded as a “negative interaction” if it related to police violence, arrest, harassment, theft, bribery or fines. Conversely, “positive interaction” denoted police assistance with, for example, laying a complaint or warning a participant about potential danger.
- As requested, the following changes were made in the manuscript in reference to the Tables:
Table 1 shows that participants in each phase were on average about 30 years old and close to half had been in the sex work industry for five or more years.

Descriptive analysis of qualitative data on these changes is presented in Table 3.

Table 4 shows that across each study period, about a third of participants reported contact with the police. Among those who had police contact, nearly two thirds reported this as a negative experience before the event, compared to half during or after the event (a not significant difference).

7. Discussion: There is some awkward phrasing used in the discussion. Suggest having a careful read-through for clarity. Some examples:

a. Second paragraph: “Our evidence..” – an awkward way to word this sentence. In this and similar sentences, suggest something like: “Evidence from our study does not suggest...”

Don’t use an m–dash: suggest either breaking up the sentence or re–wording to make it more readable.

Response:

- The 2nd paragraph now reads as follows:
  - Evidence from our study does not show an increase in cross–border migrant sex workers during the World Cup, with the proportion of sex workers born in South Africa remaining about 60%.

- We have removed em–dashes in the following places:

- Page 4:
  - Academia–based researchers collaborated with the Sex Worker Education and Advocacy Taskforce (SWEAT) and Sisonke Sex Worker Movement (two sex worker NGOs) to identify three South African cities that hosted World Cup matches where Sisonke operated.[28]
  - This site comprised slums within a platinum mine area about 15 kilometres outside Rustenburg city, the closest town to the soccer stadium.
  - The wide range of descriptions about how the sex industry had been altered by the World Cup is striking, and suggests large variation in individual sex workers’ experiences.
Calls were made to the South African government and FIFA before the World Cup to focus on sex work and to make paid sex safer, including appeals to decriminalise sex work, [64] or to implement sex work–specific health interventions in areas of concentrated sex work activity. [65, 66]

b. Suggest combining the limitations section into one paragraph and editing for repetition and conciseness.

Response:

The limitation section has been substantially revised, combined into one paragraph only, and carefully checked for repetition.

Major Compulsory Revisions (which the author must respond to before a decision on publication can be reached)

8. One of the major limitations of this paper is obviously that the authors only assess changes using a bivariate approach. This approach greatly limits the plausibility of results and should be addressed in more detail in the limitations section. The limitations of serial cross-sectional surveys to assess changes over time should also be discussed. In addition, to make this more prominent, in the methods of the abstract, it should be made clear that this study can only look at bivariate associations, and this should be mentioned in the discussion.

Response:

This is an important limitation and we include mention of this as suggested by the reviewer.

The Limitation section now reads:

- The study has several limitations which restrict the ability to draw inferences about the findings or to generalise them to other settings. The sampling methods used were unable to collect true population–level samples. To obtain more representative samples of this hidden population, future studies should consider employing Respondent–driven sampling (RDS) or weighting of samples [71]. Also, methods of linking participants over different time periods could be used, such as asking women to take a unique identifying number, which they then provide to an interviewer in a subsequent phase. This study was unable to link sex workers across phases and to thus account for having repeated measures on the participants who enrolled in more than one phase. We believed that collecting identifying information from
participants might infringe participant confidentiality and decrease acceptability of the study, particularly at a time of reports of increased police attention to sex work.\cite{72} Also, absence of data from clients limits the ability to draw conclusions about sex work demand. Further, use of only bivariate analyses does not enable us to control adequately for potential confounding factors.

- The Methods in the Abstract has been changed to the following:
  - Trained sex worker interviewers conducted face-to-face semi-structured interviews among consenting female sex workers during May–September 2010. Using bivariate analyses we compared supply, demand, sexual risk-taking, and police and health services contact pre–World Cup, to levels during the World Cup and after the event.

- The Discussion section reads:
  - Results, based on bivariate analysis of cross-sectional surveys administered before, during and after the World Cup, do not provide evidence of large changes in sex work supply or demand in the sex workers surveyed. Few substantial changes were noted across the indicators used to assess changes in sex work supply, demand or sexual behaviour during the event. These findings echo those of a related project that entailed a three-wave cross-sectional telephonic survey of female sex workers advertising online and in local newspapers in South Africa during the same event.\cite{46} Similarly, a before-and-after study of local sex work settings during the 2010 Winter Olympics in Vancouver found no evidence of an influx of sex workers, new sex workers, youth or reports of trafficking.\cite{47} Unlike in our study, however, the Vancouver research team did find that sex workers perceived a heightening of police harassment during the Olympic period.

- 9. Did the authors collect any information on whether or not women responded to previous surveys (even if the surveys cannot be linked, which certainly makes sense in a setting like South Africa where sex work is criminalized)? If this proportion is low, it could make sense to combine all surveys together, with ‘round of survey’ as a covariate and conduct multivariable analysis to strengthen study results. Or, a sub-analysis could be done – if not for this paper, for another. It would be very interesting to see those results. If the proportion is high, this leads to a potential problem with the analysis, since repeated measures aren’t used…it’s important to make this very clear. Basically, if you are comparing the same population over time,
or a high proportion thereof, it would make sense that there would be small changes in the age groupings or the proportion of migrants, and that the World Cup would not have had an impact. If you are comparing the same samples over time, then your results relating to changes in supply/demand are that much stronger.

Response

- In the World Cup phase and post–World Cup phase, we asked participants if they had filled in a similar survey at another point. Only a small proportion indicated that they had done so, and we have now included this information in the manuscript:
  - In the Results section, we now note the following:
    - “A fifth (18.2%) of participants during the World Cup reported that they had filled in a study survey previously, and a third (36.6%) noted the same post–World Cup;”

- In the Methods section, we added
  - Finally, in the surveys during and after the World Cup, participants were asked whether they had previously completed a similar survey.

- In the limitations section we note the problems resulting from not being able to link women across the surveys and note that future studies should do so:
  - Also, methods of linking participants over different time periods could be used, such as asking women to take a unique identifying number, which they then provide to an interviewer in a subsequent phase. This study was unable to link sex workers across phases and to thus account for having repeated measures on the participants who enrolled in more than one phase.

10. Related to the above point, it appears that the authors are assuming that their study sample is population-based, due to the nature of their sampling scheme (choosing every third sex worker) – since the authors interpret changes in the study sample as being markers of a change in the actual population of sex workers, reflecting the impact of the World Cup. I’m not so sure that this is the case. Given the hidden nature of sex work, it is very difficult to get a population-based sample. Moreover, weighting can be useful in order to extrapolate measures of the sample population to the overall populations (see Ramesh et al 2008 “Determinants of HIV prevalence among female sex workers in four south Indian states: analysis of cross-sectional surveys in twenty-three districts. AIDS, 22, S35–S44” for details). If this is the case, this again needs to be clarified in the abstract and the limitations section in the discussion.
Response:

This is a key point. We have amended the wording in the manuscript in the following places to reflect that we are referring to the sample we drew and not to the sex worker population as a whole, and included a reference to the useful Ramesh study:

- In the abstract, we added the following:
  - Although the study design employed was unable to select population-based samples, these findings do not support the public concern and media speculation prior to the event, but rather signal a missed opportunity for public health action.

- In *Study measures and statistical analysis*:
  - The impact of the World Cup was measured by comparing the characteristics of the samples we obtained in the three phases. This was based on the assumption that any changes detected in the samples would reflect the impact of the World Cup on the broader sex work population. Fluctuations in characteristics of the sex worker samples were used to indicate whether a change had occurred in the supply of sex work.

- In the *Results* section we refer to comparisons between samples in several places:
  - In each of the study samples, approximately two thirds were single, and 15% lived with their regular partner.
  - Differences were detected in education level in the three samples, with fewer women sampled during the World Cup having tertiary qualifications (3.5%) compared to pre–World Cup (8.6%), though in each phase about a fifth had not completed primary school. Similarly, some differences were detected in the number of dependents and main venue where women solicited clients.
  - The proportion of women who were drunk at last sex also did not fluctuate across the samples, remaining at around 43%.

- In the *Discussion* section:
  - Similarly, the proportion of sex workers in the study samples who were below 24 years remained relatively constant throughout the research period.

- Under limitations:
  - The sampling methods used were unable to collect true population–level samples. To obtain more representative samples of this hidden population, future studies should consider employing Respondent–driven sampling (RDS) or weighting of samples [71]. Also, methods of linking participants over different time periods could be used, such as asking women to take a unique
Identifying number, which they then provide to an interviewer in a subsequent phase.

- We include the weighting idea and reference to the Indian study provided by the reviewer.

11. The way the abstract methods section is worded implies (or at least could be misinterpreted) that you are following the same sex workers over time (particularly since you use the word ‘repeat' in the first sentence, which naturally would make a reader think of ‘repeated measures'). Please re-word this to clarify the above-described limitations for the reader. In particular, you need to make it clear how you are assessing the impact of the World Cup (i.e., you assume that changes in the sample can reflect the impact of the World Cup).

Response:

- We have removed the word ‘repeat’ in all instances of ‘repeat cross-sectional study’ in the manuscript.
- The following changes were made to avoid any confusion that the cross-sectional surveys were linked to specific participants over the three time periods:
- The abstract has been amended to the following:
  - In the Methods section of the abstract:
    - Trained sex worker interviewers conducted face-to-face semi-structured interviews among consenting female sex workers during May–September 2010.
  - In the Methods section:
    - Cross-sectional surveys with self-identified female sex workers were conducted over three points in time.
  - Under Study measures and statistical analysis:
    - The impact of the World Cup was measured by comparing the characteristics of the samples we obtained in the three phases. This was based on the assumption that any changes detected in the samples would reflect the impact of the World Cup on the broader sex work population.

12. Accordingly, related to the above, please re-word the Results section carefully to take this into account. The wording you use, i.e. Results, Sex work supply, line 4: “Across all phases, only a small number of women arrived in the city in the last month...” implies that
these results are more objective than they are. To do this, you could clarify that these are changes in the sample populations, not changes in the same sample population over time.

Response:

The following changes were made:

- **Under Results**
  - In each of the study samples, approximately two thirds were single, and 15% lived with their regular partner.
  - Differences were detected in education level in the three samples, with fewer women sampled during the World Cup having tertiary qualifications (3.5%) compared to pre–World Cup (8.6%), though in each phase about a fifth had not completed primary school.

- **Under Sex work supply:**
  - Only 12.9% of participants in the pre–World Cup period had entered sex work in the last year, while 1.3% began the trade in the last month (Table 2).
  - Similarly, only a fraction of women in the during and post–World Cup samples reported having recently begun sex work. Few had arrived in the city in the last month, though more pre–World Cup than after the event (2.4% vs. 0.4%; \(P=0.011\)).
  - No changes were detected in the proportion of non–South African women in each sample, which remained close to 40% in each phase.
  - A similar proportion of women reporting being full–time sex workers before (75.6%) and during the World Cup (73.0%, \(P=0.33\)), however, among sex workers sampled after the event, fewer reported being full–time sex workers (64%; \(P<0.001\) compared to before and \(P=0.02\) compared to after the World Cup).

- **Under Sex work demand and sexual risk behaviour**
  - The proportion of women who were drunk at last sex also did not fluctuate across the samples, remaining at around 43%.

13. Also in the limitations, it should be clarified that no rigorous analysis of qualitative results was done (I assume this is the case? i.e., no thematic coding, etc.). They are interesting, but the limitations need to be clear.

Response:

The following was included in the limitations section:
Qualitative data on World Cup changes were grouped according to themes and are represented as such, but rigorous thematic content analysis was not conducted.

We also added text to clarify how the free-text responses provided by participants was analysed:

Participants during and after the World Cup were asked whether the event had led to changes in the sex work industry, and if so, to describe such changes in an open-ended question. Researchers coded these free-text responses as “negative” (more competition, less clients, less income, or increased police harassment); “positive” (more foreign currency, more business, could charge more, or improved relationship with police); or “mixed experiences”, both positive and negative. Finally, in the surveys during and after the World Cup, participants were asked whether they had previously completed a similar survey.

14. Analysis: why did the study authors not compare II versus III (Table 2)? This could be a particularly interesting comparison. I would suggest that the authors add another column in the Table to do these comparisons. The reason for this is that often in the lead-up to large-scale sporting events, changes are already happening that can influence sex work (including one month before the event), while after, things tend to go back to normal a bit. While the authors discuss the timing of the surveys in some detail in the discussion, it would be helpful to discuss this a bit further in the South African context. A strength of the survey timing is that September could be far enough past the World Cup dates to better detect changes – in this case, comparing II and III could be more useful than comparing I and II.

Response:

- Table 2 has been expanded to include a p-value column in which the During World Cup time period is compared to post–World Cup. Few differences were detected.
- The Sex Work Supply subsection has the following addition:
  - No changes were detected in the proportion of non–South African women in each sample, which remained close to 40% in each phase. A similar proportion of women reporting being full-time sex workers before (75.6%) and during the World Cup (73.0%, \( P=0.33 \)), however, among sex workers
sampled after the event, fewer reported being full-time sex workers (64%; \( P < 0.001 \) compared to before and \( P = 0.02 \) compared to after the World Cup).

- The *Sex work demand and sexual risk behavior* subsection has the following addition:
  - No difference was detected in the median number of clients in the last week before and during the World Cup (12 clients and 11 clients respectively), but slightly higher client numbers were reported post–World Cup (13 clients, \( P = 0.04 \) comparing during and post–World Cup).

15. Discussion: The discussion could be more robust and thorough in comparisons with other studies, where possible.

  a. The first paragraph should give a bit more detail on the measures compared and the study design, e.g.,: “Results from our serial cross-sectional study do not provide evidence of changes in the study populations across three waves of surveys administered before, during and after the World Cup, on the following indicators of supply and demand of sex work: …”

Response:

Our *Discussion* section is very long already, so we incorporated all the suggestions above apart from explicitly listing all the indicators employed.

The following changes were made to the *Discussion* section

- Results, based on bivariate analysis of cross-sectional surveys administered before, during and after the World Cup, do not provide evidence of large changes in sex work supply or demand in the sex workers surveyed. Few substantial changes were noted across the indicators used to assess changes in sex work supply, demand or sexual behaviour during the event. These findings echo those of a related project that entailed a three-wave cross-sectional telephonic survey of female sex workers advertising online and in local newspapers in South Africa during the same event.[46] Similarly, a before–and–after study of local sex work settings during the 2010 Winter Olympics in Vancouver found no evidence of an influx of sex workers, new sex workers, youth or reports of trafficking. [47] Unlike in our study, however, the Vancouver research team did find that sex workers perceived a heightening of police harassment during the Olympic period.
b. For the second and third paragraphs, where the authors compare to other studies, I suggest authors look at the following study, which may not have been out when the paper was submitted, but could be useful (particularly related to supply and demand), as our study looked at similar outcomes related to the 2010 Winter Olympics in Vancouver: Deering KN, Chettiar J, Chan K, Taylor M, Montaner JS, Shannon K. Sex work and the public health impacts of the 2010 Olympic Games. Sexually Transmitted Infections. 2012; 88(4): 301–3.

Response:

- Thank you for pointing out this very pertinent study. We now refer to it in the following way:
  - Similarly, a before-and-after study of local sex work settings during the 2010 Winter Olympics in Vancouver found no evidence of an influx of sex workers, new sex workers, youth or reports of trafficking. Unlike in our study, however, the Vancouver research team did find that sex workers perceived a heightening of police harassment during the Olympic period.

- In addition, we also added the following references in order to update the literature the article draws on, and to tie to current events such as the London Olympics and the Euro 2012 tournament:
c. The third, fourth and fifth paragraphs are very important, as they detail the study implications. These could be combined into at most two paragraphs, with the fifth paragraph (which is very interesting) better relating to the results of the study, for better flow of the article.

Response:

The reviewer rightly points out that these paragraphs form the crux of the article. We have substantially revised many sections of the Discussion based on the comments received from the reviewers, added several new pieces of information and were thus required to edit the previous text somewhat to ensure the discussion section did not become too long.

d. Please provide some details about what is meant by ‘alcohol interventions’ and why these are important to HIV risk. Similarly, it would be useful to briefly expand on the evidence for the relationship between police harassment/policies and HIV risk.

Response:

- Alcohol: The following change was made to the Discussion section:
  - This study again demonstrates the need for alcohol interventions, as a rapidly expanding body of evidence links hazardous alcohol use, especially binge drinking, with unsafe sex and HIV acquisition.[48, 49] Strategies to reduce alcohol’s burden and its effects on sexual behaviour include screening for alcohol use, referrals to programmes that reduce alcohol dependence, multi-level structural interventions and sex work venue-based programmes. [50, 51]

- Police: The following was added to the Discussion section:
  - Findings on police contact and high proportions of negative experiences are consistent with other studies that report frequent harassment and sex worker human rights violations by police in South Africa, [39, 40, 52, 53] as elsewhere on the continent. [54, 55] These experiences compound the marginalisation of this group, [56, 57] and impact adversely on health. For example, studies in South Africa note police confiscation of condoms from sex workers as ‘evidence’ that commercial sex had taken place [38, 58], while recent reports from Cape Town describe police harassment of outreach teams engaged in health promotion and HIV education with sex workers. [59, 60].
Police rape of sex workers has also been widely documented. [38, 39] A 28-year respondent in Johannesburg in our study recounted: “I remember when they [the police] arrested me in my hotel for loitering and they find me while I was sleeping and they rape me first before they arrest me”.

e. Why do the authors think that peer contact was so low, even when the study was conducted in settings chosen based on the peer/advocacy groups? This could be related more strongly to the lack of resources available during the World Cup (and at other times).

Response:

- The reviewer is correct that it reflects on the lack of focus on and funding for sex worker health promotion and health provision programmes in South Africa at that time. We note that this has thankfully shifted in the past year and additional funding is available and the government has increased its efforts to assist this population. We try and strengthen this point by adding the following in the Discussion:

  - The decreased contact with health care workers during the World Cup period signals a major missed opportunity. Contact with peer educators was consistently below 4%, despite the fact that research sites were selected because of sex worker organisations or peer educator presence, and is in stark contrast with India where close to two thirds of sex workers report regular contact with peer educators.[61] This indicates the general lack of interest in sex worker support and programmes in South Africa, and specifically during the World Cup period.

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Referee 3

Reviewer: Helen Ward

Reviewer's report:

General comments
1. This article has a concise and appropriate background, although I would suggest linking it to some of the similar recent discussions around the Olympics in London 2012 to make it even more topical. There is a clear aim to assess whether there was a change in the supply of and demand for sex work services during the World Cup in South Africa. This is a difficult question to answer given the clandestine nature of sex work.

Response:

A very important point. The first paragraph of the Introduction now reads:

- International sporting events are increasing in frequency and magnitude. Much media attention, especially prior to these events, highlights the presumed links between spectators and sex work during large sports tournaments. [1–4] These concerns were again raised in the recent preparations for the 2012 London Olympics. [5–8]

- We have included the following updated references:
2. The repeated cross-sectional survey is a reasonable approach although it has significant limitations. The design is well described, the data appear to be sound. I think a particular limitation is the inability to link respondents across the data collection rounds. Although this is cited as being due to then need not to keep identifiers for the women, it would have been possible to make some linkage (asking women for some kind of unique identifier that they could use each time but that could not be used to identify them), or even by including a question about whether they had taken part in previous rounds to get an idea of the overlap.

Response:

- We agree that the inability to link participants across time periods is an important limitation of the study. At the time the research was conducted, police raids on the sex industry were taking place and the levels of suspicion amongst sex workers were high. We fear that requesting potential participants to carry or provide unique identifiers might have reduced willingness to participate in the study. We note that there might have been some alternatives that we hadn’t considered, such as the one suggested by the reviewer, and which we have included in the limitation section.

- The limitations section now includes the following:
  - The sampling methods used were unable to collect true population-level samples. To obtain more representative samples of this hidden population, future studies should consider employing Respondent-driven sampling (RDS) or weighting of samples [71]. Also, methods of linking participants over different time periods could be used, such as asking women to take a unique identifying number, which they then provide to an interviewer in a subsequent phase.

- In the World Cup phase and post–World Cup phase, we asked participants if they had filled in a similar survey at another point. Only a small proportion indicated that they had done so but we were unable to link them to their previous surveys. We have now included this information in the manuscript:
  - In the Results section, we now note the following:
    - “A fifth (18.2%) of participants during the World Cup reported that they had filled in a study survey previously, and a third (36.6%) noted the same post–World Cup.”

- In the Methods section, we added
  - Finally, in the surveys during and after the World Cup, participants were asked whether they had previously completed a similar survey

3. There is no reference to particular standards for reporting and data deposition, but the key elements of the reporting appear to be OK.

Response:
We have now checked the manuscript against the STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) “Checklist of items that should be included in reports of observational studies” (Version 4; published in Oct / Nov 2007; available: http://www.strobe-statement.org/fileadmin/Strobe/uploads/checklists/STROBE_checklist_v4_combined.pdf) and the manuscript adheres to its guidelines.

We added the following to the Methods section:

- Questionnaires from the sites were couriered or personally delivered to the principal investigator (MR) for data entry at the central Johannesburg site.

As set out in the paper, data management was as follows:

1. Due to the criminalised nature of sex work in South Africa, and care was taken not to collect any identifying information from participants.
2. Data were password-protected
3. Data access was restricted to the project’s data analysts.

4. The discussion and conclusions are well balanced and adequately supported by the data, and the limitations are clearly stated.

5. The authors clearly acknowledge work upon which they are building.

6. The title could be revised to indicate the key findings – it is currently only indicating the topic.

7. Abstract is fine and the writing acceptable

Discretionary Revisions

8. Consider changing the title to indicate the key findings

Response:

- The title has been changed to “Female sex work and international sport events – no major changes in demand or supply of paid sex during the 2010 Soccer World Cup: a cross-sectional study”
9. Consider referring to academic and other articles on sex work and the London 2012 Olympics.

Response:

- Please refer to point 1 above.

Minor Essential Revisions

10. Final para of introduction the phrase “supporters… would require paid sex” is odd. It seems more consistent to stick to the term “demand” rather than infer some other driver. In the final paragraph of the introduction remove reference to the method (“using repeat cross sectional survey.”) since this is more appropriate for the methods section.

Response

- The following changes were made to the final paragraph of the Introduction to address the concerns raised above:
  - Underpinning many of the campaigns in South Africa, was the assumption that World Cup soccer supporters (whether international tourists or locals) would require paid sex, and that this spike in demand would be matched by an increase in the supply of sex workers, or the trafficking of women and children.[29] Evidence on the impact of this event on the sex industry could assist future planning for mass entertainment events and inform better targeting of health resources and other opportunities that become available during these events. The study therefore aimed to assess whether there was a change in demand or supply of sex work during and after the South African World Cup. We also examined changes in sexual behaviour, police contact and health services for sex workers across these phases to gauge how the World Cup affected sex workers’ working conditions and interaction with services.

11. Results – there is no need to repeat detailed data in the text where it is in the tables; in the text it is sufficient to highlight the main findings but not to repeat all the p values etc. if these are available in the tables.
Response:

- *We have now removed the p-values in all instances except for main findings*

12. Results, under working conditions, second paragraph. The wording of the second sentence needs to be changed to indicate that there was a non-significant change in the proportion reporting negative experiences with the police.

Response:

- *The sentences now read:*
  - *Among those who had police contact, nearly two thirds reported this as a negative experience before the event, compared to half during or after the event (a not significant difference).*

**Major Compulsory Revisions**

13. The results should present the demographic data from each of the three time periods, some of which is reported but “not shown”. Currently only baseline data are shown in Table 1. The addition of two more columns with the during and after figures would be helpful.

Response:

- *We have now expanded the data in Table 1 to include socio-demographic characteristics for all three time periods, and described these in the manuscript.*
- *Our original rationale for only depicting baseline characteristics was the following: In our analysis plan we decided to evaluate changes in supply of sex workers by assessing whether there were differences in the socio-demographic characteristics of sex workers across the 3 phases. These variables were thus presented in table 2. Any changes in characteristics of sex workers between the three periods may well have been due to an increased supply of sex workers. For example, an increase in entry of young sex workers into the trade during the World Cup would have lowered the mean age in the second period. Our intention was to examine change in socio-demographic variables across phases as measures of supply in Table 2, where we use a comparison of the sex workers in the three phases to infer whether supply was altered. The relatively large sample size in each phase meant that though some changes were
significant, it was also important to assess whether the size of any changes detected was likely to suggest a major increase in supply.

- We have adopted the Reviewer’s recommendation and depicted the socio-demographic characteristics of participants over the three periods.
- Our Results section now reads as follows:

Our analysis was based on 601 pre–World Cup participants, 508 during the World Cup and 538 after the event. A fifth (18.2%) of participants during the World Cup reported that they had completed a study survey previously, and a third (36.6%) noted the same post–World Cup. Table 1 shows that participants in each phased were age about 30 years on average and close to half had been in the sex work industry for five or more years. In each of the study samples, approximately two thirds were single, and 15% lived with their regular partner. Differences were detected in education level in the three samples, with fewer women sampled during the World Cup having tertiary qualifications (3.5%) compared to pre–World Cup (8.6%), though in each phase about a fifth had not completed primary school. Similarly, some differences were detected in the number of dependents and main venue where women solicited clients (higher proportion reported working in a combination of venues during and after the event). Indicators of supply and demand for sex work are presented in Table 2 and described below.

**Sex work supply**

Few differences were detected in the indicators of supply of sex work. The proportion of women under the age of 24 was 20.6% during the World Cup, comparable to before the World Cup (17.9%; \( P=0.25 \)), but these levels post–World Cup were 5% higher than before the event (22.9%, \( P=0.037 \)). Only 12.9% of participants in the pre–World Cup period had entered sex work in the last year, while 1.3% began the trade in the last month (Table 2). Similarly, only a fraction of women in the during and post–World Cup samples reported having recently begun sex work. Few had arrived in the city in the last month, though more pre–World Cup than after the event (2.4% vs. 0.4%; \( P=0.011 \)). No changes were detected in the proportion of non–South African women in each sample, which remained close to 40% in each phase. A similar proportion of women reporting being full–time sex workers before (75.6%) and during the World Cup (73.0%, \( P=0.33 \)), however, among sex workers sampled
after the event, fewer reported being full-time sex workers (64%; \(P<0.001\) compared to before and \(P=0.02\) compared to after the World Cup). Similar findings were obtained when data was stratified according to city, while no significant interaction was observed within cities in supply or demand (data not shown).

**Sex work demand and sexual risk behaviour**

No difference was detected in the median number of clients in the last week before and during the World Cup (12 clients and 11 clients respectively), but slightly higher client numbers were reported post–World Cup (13 clients, \(P=0.04\) comparing during and post–World Cup). The median amount charged per client did not fluctuate, remaining a median $13 per client in all phases. Also, no differences were detected in unprotected sexual intercourse with last client across the three periods, which remained below 7.6%. The proportion of women who were drunk at last sex also did not fluctuate across the samples, remaining at around 43%. Also, the proportion reporting frequent binge drinking was similar before (94/577, 16.3%) and during the World Cup (83/451, 18.4%; \(P=0.37\)), but higher among women in the period after the event (118/505, 23.4%; \(P=0.06\) for the after during comparison and \(P=0.003\) comparing after and with before the event).

**Working conditions and health service utilisation**

Only a third of participants (322/1046) reported that the sex industry had been altered by the World Cup (94 noting a negative change, 222 a positive change, 6 had mixed experiences). Descriptive analysis of qualitative data on these changes is presented in Table 3. In their free-text responses, a few reported observing a larger number of sex workers, while others remarked on an increase in the business and income earned. Most, however, had experienced the contrary, and noted the adverse impact of the cold weather and of supporters’ absorption with soccer matches on demand for sex work. Some said that working conditions had improved with the World Cup, such as refurbishments to the hotels where they worked and more assistance from peer educators.

Table 4 shows that across each study period, about a third of participants reported contact with the police. Among those who had police contact, nearly two thirds reported this
as a negative experience before the event, compared to half during or after the event (a not significant difference).

Throughout the research period, just under two thirds had contact with health care in the preceding month (Table 4). The proportion of respondents who had contact with health care was 5% lower during the World Cup phase (57%) than before the event (62.4%; \( P=0.075 \)). Levels of contact with peer educators were disappointingly low in each period, even decreasing from 3.7% before the event to 1.1% during the World Cup (\( P=0.007 \)).

14. Please clarify what parameters are being used to define sex work “supply”. In methods and the table this includes proportion under 24, where born, recent arrival etc, whereas in the text some of these are reported before the sub-heading “sex work supply”.

Response

- Indicators relating to sex work supply are: proportion of women under 24, born in South Africa, arrival in city in last month, entered sex work in last month and full-time sex work.
- Data that relate to these variables have now been moved to the Sex Work Supply subsection.

15. Under sex work demand, the text is unnecessarily repetitive (see also point 11 above) where the data are in the tables.

Response:

- We have now removed the \( p \)-values in all instanced except for main findings, and removed some repetitive or redundant text.

16. In the paragraphs on working conditions that combines some categorical responses with some textual analysis it would be helpful to present some more analysis of what these two different types of data show. At the moment the free-text responses are very broadly grouped into positive and negatives, but in Table three there are a few key themes that could be explored in more detail. For example, were those who reported positive changes such as “business was burning, we made a killing” and other reports of increased business (24), different in any way, from those who reported the opposite, for example in where they worked. i.e. were there patterns in this qualitative data.
Response:

- The authors are planning to write an article on qualitative data collected in a few focus groups held in these populations, here we only present some coding of a few free-text responses that we had included in the quantitative survey. Due to the space limitations in this article, we focus on the quantitative data only, and include Table 3 to provide more background and texture to these findings.

- The following was thus included in the “Limitations” section:
  - Qualitative data on World Cup changes were grouped according to themes and are represented as such, but rigorous thematic content analysis was not conducted.

17. The discussion is rather too long and repeats what is in the results. The structure is good, and conclusions appear to be sound, but could be shorter.

Response:

We have revised the discussion and edited the text considerably. We hope the revised version is more concise and focused.