ORIGINAL ARTICLE

Decreasing STD incidence and increasing condom use among Chinese sex workers following a short term intervention: a prospective cohort study

S Ma, N H T M Dukers, A van den Hoek, F Yuliang, C Zhiheng, F Jiangting, Z Lina, Z Xiuxing

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See end of article for authors' affiliations

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Correspondence to:
Nicole H T M Dukers,
Municipal Health Service,
Cluster Infectious Diseases,
Nieuwe Achtergracht 100,
1018 WT Amsterdam,
Netherlands;
ndukers@gggd.amsterdam.nl

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Objective: To describe the impact of a repeating behavioural intervention focused on preventive education and provision of STD testing and treatment services to female sex workers.
Methods: A prospective cohort study of 966 sex workers (first of its kind in China) was conducted in Guangzhou from March 1998 to October 1999. At each visit information was collected on sexual behaviour, condom use and knowledge about HIV transmission and condom use, education was given, STD were diagnosed, and treatment was provided free of charge. We evaluated trends in condom use, knowledge about HIV transmission and condom use, and STD incidences. Generalised estimating equations were applied to control for repeated measurements.
Results: The proportion of consistent condom use increased from the intake through the third follow up visit (from 30% to 81%), as well as the proportion of having good knowledge on HIV transmission (4.3% to 98.6%) and condom use (23.6% to 79.3%). The incidence of gonorrhoea, trichomoniasis, and chlamydia decreased over each follow up visit; from 17.5/100 person years (PY), 22.4/100PY, 65.9/100PY at the first follow up visit to 5.1/100PY, 3.0/100PY, 16.1/100PY at the third follow up visit, for each STD respectively.
Conclusions: STD care and prevention programmes targeting sex workers are feasible in China and, more importantly, intervention consisting of prevention education and STD care is likely to reduce unprotected sexual behaviour and STD incidence in this group at high risk for HIV and other STD infection.

S exually transmitted diseases (STDs) were common before and during the early period of the founding of the People's Republic of China in 1949. They were virtually eliminated across the country by 1964,[1-3] but reform and opening up policies, started in 1978, have rapidly changed the situation, especially in the past 10 years. The number of STD cases reported increased from 13 in 1977 to 153 305 in 1990, 360 206 in 1995, and 632 512 in 1998.[1 4] Similarly, commercial sex was eradicated in the early 1950s but has re-emerged throughout China since the 1980s.[2 3 5] The re-emergence of commercial sex has had a critical role in the re-emergence of STDs, and has been noted by Chinese and foreign researchers.[2 3 5 6] Whereas, currently, more than 70% of the reported HIV seropositive individuals in China were infected through the injection of drugs, heterosexual transmission of HIV has increased and could become the dominant mode of transmission.[7]

In response to the increase of STD prevalence and of the prevalence of HIV infection through heterosexual transmission in China, we developed an intervention programme which included a prospective cohort study for women who identified themselves as sex workers. Although prostitution is illegal in China, in recent years more and more women have engaged in it under the threat of being arrested and detained in women's re-education centres. Our programme is the first intervention study of this kind to target Chinese sex workers. The encouraging participation rate reported previously[8] shows that setting up an STD care and prevention programme for this group is feasible in China. Moreover, its baseline findings of high STD prevalence and poor knowledge about HIV transmission and condom use among these women shows potential risk for the rapid spread of HIV.[8] The aim of the present study was to describe the impact of the educational intervention

given to the women at each study visit. This intervention focused on knowledge about STD/HIV, on improving skills related to condom use, and on providing STD testing and treatment services.

MATERIALS AND METHODS
General procedures
Guangzhou, located at the north of the Pearl River delta, is an important trading centre as well as a busy port and the capital city of the province of Guandong. The city has an area of over 16 000 square kilometres and a population of 6.7 million. Being close to the South China Sea and neighbouring Hong Kong and Macao, the economy of this city is well developed when compared with other cities in China. From March 1998 to October 1999, an intervention programme with ongoing recruitment during the intervention period was conducted in Guangzhou focusing on sex workers.[8] All consenting subjects were interviewed by a trained nurse using standardised interviewer administered questionnaires. After the interview individual or group counselling was provided on reproductive health, STD/HIV transmission, and skills related to condom use by trained doctors or nurses. Spoken information was complemented with written and video material. After this education, physical examination and testing for STDs were conducted by trained doctors. At follow up visits every 2 months, the procedure and education given were the same as at the intake visit.

Vaginal samples, taken from the posterior fornix, were tested by wet mount for the presence of trichomoniasis; cervical samples were tested for the presence of *Neisseria gonorrhoeae* by culture and *Chlamydia trachomatis* by LCX (Abbott Laboratories,

North Chicago, IL, USA), and blood samples were tested for antibodies to syphilis using the *Treponema pallidum* haemagglutination assay (TPHA; Biokit, Spain, SA) and rapid plasma reagin test (RPR; Rong Sheng Biostix Inc, Shanghai, China).

Women were asked to call for results of the laboratory tests and come to the clinic for free treatment if needed. Gonorrhoea was treated with a single injection (250 mg) of ceftriaxone; chlamydial infection was treated with a single dose (1 g) of azithromycin; *Trichomonas vaginalis* infection was treated with a single dose (2 g) of metronidazole, and early syphilis was treated with a single intramuscular injection of 2.4 million units benzathine penicillin.

Variables

The present study utilised information gathered at each visit regarding sociodemographics, sexual behaviour (past 2 months), and diagnoses of STD. Information on sexual techniques and condom use (measured "always" (100%), "frequently" (50%–99%), "rarely"(1%–49%), and "never" (0%)) was regrouped into consistent ("always") and not consistent (all others). Knowledge about HIV transmission and the preventive role of condom use, as well as self efficacy to use condoms were measured by asking all women whether they agreed or disagreed with a number of statements (see Appendix). We classified women who scored correctly on all statements as having "good" knowledge and others as having "poor" knowledge. Similarly, we classified those who got full score on self efficacy as having "good" self efficacy.

We assumed that women who got treatment for STD were cured. We defined STD cases as new infections when the women were diagnosed with an STD at the current visit and either were not diagnosed with that same STD at the previous visit or were treated for that STD after the previous visit. Once a woman was diagnosed with an STD, we considered her at risk again for that STD following the day on which specific treatment was given.

Statistical methods and procedure

Because only 75 out of 966 women (7.8%) exceeded three follow up visits we limited our study from intake through the third follow up visit. We investigated whether women with three follow up visits differed from women with less than three follow up visits, comparing general and sexual characteristics, as well as knowledge and self efficacy to use condoms (using Student's *t* test, Kruskall-Wallis test, and χ^2 test).[9] Subsequently, we evaluated trends over the study visits in knowledge, consistent condom use, sexual behaviour, and STD incidences using information from the total group of 966 women. We repeated the analyses using information from only those women who had completed three follow up visits. Potential predictors for consistent condom were determined by using logistic regression analyses. We included factors, which had a p value of less than 0.10 in univariate analyses, in a backward procedure to construct a multivariate model. All analyses were performed with generalised estimating equations (GEE)[10] to correct for dependency between measurements within an individual (assuming a compound symmetry covariance structure). In evaluating trends in STD incidences, we assumed a Poisson distribution.[11] We considered a p value less than 0.05 as statistically significant.

RESULTS

Participation

A total of 966 women were recruited into the study. Of these, 815 (84%) returned for the first follow up visit, 626 (65%) for the second, and 512 (53%) for the third. The median length of time between visits was 69 days (interquartile range (IQR) 58–87 days).

Characteristics of the population at baseline

Characteristics at baseline for the total group of 966 women, for women who had less than three follow up visits, and for women who had completed three follow up visits, were summarised in table 1.

In comparison with women who had less than three follow up visits, women who had three follow up visits were younger in both current age and age at commencement of being paid for sex, but older in age of leaving education. They more often reported at least 1 year's experience of being a sex worker, and (borderline significantly) good knowledge about the use of

Table 1 Characteristics of 966 sex workers at study baseline, cohort of sex workers, Guangzhou, China, March 1998–October 1999

	All women (n=966)		Women with <3 follow up visits (n=454)		Women with 3 follow up visits (n=512)		p Value*
Mean age (SD)	25.0	(5.3)	25.6	(5.3)	24.4	(5.3)	<0.001
Mean age at commencement of being paid for sex (SD)	22.9	(5.0)	23.8	(5.1)	22.2	(4.8)	<0.001
Mean age leaving education (SD)	15.1	(2.9)	14.9	(2.9)	15.3	(2.9)	0.016
Median years of sex work (IQR)	1	(0.5–2)	1	(0.5–2)	1	(1–2)	0.001
Median workdays per week (IQR)	5	(4–5)	5	(4–5)	4	(4–5)	0.234
Median number of clients per week (IQR)	7	(5–8)	7	(5–8)	7	(5–8)	0.682
Having regular income	524	(54.2)	254	(55.9)	270	(52.7)	0.317
Having steady partners past 12 months	399	(41.3)	207	(45.6)	192	(37.5)	0.011
Drug injection since 1990	66	(6.9)	37	(8.2)	29	(5.7)	0.132
STD check up past 12 months	335	(34.7)	174	(38.3)	161	(31.4)	0.025
History of STD infection	82	(8.5)	55	(12.1)	27	(5.3)	<0.001
Good knowledge on AIDS transmission	42	(4.3)	19	(4.2)	23	(4.5)	0.815
Good knowledge on condom use	228	(23.6)	96	(21.1)	132	(25.8)	0.090
Good self efficacy to use condoms	313	(32.4)	172	(37.9)	141	(27.5)	0.001
Consistent condom use past 2 months	291	(30.1)	149	(32.8)	142	(27.7)	0.086

*Indicating the difference between women with less than three follow up visits and women who completed three follow up visits.

Table 2 Consistent condom use, knowledge about AIDS and about condom use, and condom use self efficacy at each visits, cohort of sex workers, Guangzhou, China, March 1998–October 1999

	No	Consistent condom use (%)	Good knowledge about AIDS (%)	Good knowledge about condom use (%)	Good condom use self efficacy (%)
Intake visit	966	30.1	4.3	23.6	32.4
First follow up visit	815	38.4	39.1	37.2	58.3
Second follow up visit	626	58.8	85.5	57.7	82.9
Third follow up visit	512	81.4	98.6	79.3	95.7
p Value*		<0.001	<0.001	<0.001	<0.001

*Indicating the trends by using GEE.

Table 3 STD incidence at follow up visits, cohort of sex workers, Guangzhou, China, March 1998–October 1999

	Gonorrhoea		Trichomoniasis		Chlamydia	
Visit	IR (100PY)	RR (95% CI)	IR (100PY)	RR (95% CI)	IR (100PY)	RR (95% CI)
First follow up	17.48	1	22.35	1	65.91	1
Second follow up	6.74	0.39 (0.18 to 0.84)	8.43	0.38 (0.19 to 0.75)	58.20	0.88 (0.66 to 1.18)
Third follow up	5.10	0.29 (0.11 to 0.75)	3.03	0.14 (0.04 to 0.45)	16.05	0.24 (0.14 to 0.41)
p Value for trend*	0.004		<0.001		<0.001	

IR = incidence rate, RR = relative risk, PY = person year, CI = confidence interval.
*Indicating the trends by using GEE.

condoms. These women less often reported having a steady partner, a history of STD check up and STD infection, good self efficacy to use condoms, and (borderline significantly) less often consistent condom use (table 1).

Changes in knowledge, self efficacy, sexual behaviours, and consistent condom use

Examining the total group of 966 women from study intake through the third follow up visit, the proportion of women with good knowledge about HIV transmission and condom use, or with good self efficacy increased significantly (table 2).

Regarding commercial sexual contact in the past 2 months, all women reported vaginal intercourse at each study visit. However, the proportion of women who always practised this technique with their clients decreased from 59.9% (579/966) at intake to 51% (416/815), 47% (291/626), and 44% (226/512) at the first, second, and third follow up visit, respectively (p value for trend <0.001). The proportion of women who frequently practised non-penetrative sex (like masturbation) increased from 30% at intake visit, to 41%, 48%, and 51% at each follow up visit (p value for trend, p<0.001). In general, the women rarely practised oral or anal sex.

The proportion of women who consistently used condom with clients in the past 2 months increased from 30% at the intake visit to 82% at the third follow up visit (table 2). When we repeated the analyses based on information of women who had completed three follow up visits, significant increasing trends for knowledge, self efficacy to condom use, and sexual practices were still present.

Predictors for consistent condom use

In univariate analysis, predictors for consistent condom use were good self efficacy to use condoms (OR=27.09, 95% CI 21.47 to 34.17), later study entry time in 1999 (OR=1.46, 95% CI 1.26 to 1.69), good knowledge about the preventive role of condoms (OR=2.51, 95% CI 2.16 to 2.91), good knowledge about HIV transmission (OR=3.63, 95% CI 3.11 to 4.23), less than 5 work days per week (OR=1.48, 95% CI 1.23 to 1.79), and history of STD check up (OR=1.39, 95% CI 1.19 to 1.62).

In multivariate analysis, the independent predictors were good self efficacy (OR=22.90, 95% CI 17.60 to 29.80); later

entry time in 1999 (OR=1.31,95% CI 1.07 to 1.60), and good knowledge on condom use (OR=1.22, 95% CI 1.00 to 1.50).

Moreover, independent of these predictors, the "risk" of consistent condom use increased with each next study visit (p value for trend <0.001). Thus, after we had controlled for several factors (self efficacy, later entry time, and knowledge on condom use), the increasing trend in consistent condom use during the study remained strongly present.

Changes in STD incidence

The incidence of gonorrhoea, trichomoniasis, and chlamydia decreased significantly at each follow up visit (table 3). We did not calculate incidence for syphilis since only three new syphilis cases had been found during the follow up period. When we restricted the analyses to women who had completed three follow up visits, declining incidence was still observed for trichomoniasis and chlamydia, but not for gonorrhoea (data not shown).

DISCUSSION

In this study, we observed a strong increase in consistent condom use and decrease in STD incidences after intervention. This study with repeating interventions, the first of its kind in China, suggests that an education programme of condom promotion and STD treatment is not only feasible but may have a considerable impact on increasing consistent condom use and reducing the number of new STD infections among sex workers in China.

In recent years more and more young women, in particular those from rural areas, have started to engage in prostitution for economic reasons in China. Since prostitution is illegal in China, these women are very difficult to approach with prevention efforts owing to their fear of discrimination, arrest, and detention. Our programme was the first to exist for sex workers outside of detention. This could account for the poor knowledge and the high STD prevalence[8] we found at baseline among our participants. In agreement with the results of a prevention care programme conducted in Zaire,[12] the impressive increases we found in consistent condom use and the significant decline in STD incidences during the follow up period demonstrates how efficacious such intervention programmes for sex workers might be in China.

However, the high level of incident STD (especially chlamydial infection) that persisted implies that sex workers are at high risk of being infected with STDs despite increasing condom use. The high level of prevalent chlamydial infection among these women (32%),[8] and among sex workers detained in re-education centres (38%),[13] may reflect a high prevalence of chlamydial infection in their male partners, not only clients but also private partners. This may be the cause of the high incidence of chlamydial infection among our study group.

It is important to note that self efficacy towards condom use in the present study appeared to be the strongest predictor of consistent condom use, suggesting that women with a high level of perceived self efficacy are more likely to persuade their clients to use condoms than those with a low level. This finding needs to be confirmed by further research but might be useful for choosing a model of behaviour change by which effective intervention could be developed in China.

The main change in sexual behaviour, next to condom use documented by this study, is a reduction of the proportion of women who engaged in vaginal intercourse with all clients in the past 2 months. Our finding of increased non-penetrative sex is in agreement with this change. A possible explanation is that after education, more women had high levels of perceived self efficacy and thus were more capable to convince their clients to practise non-penetrative sex when there was a lack of condoms or for other reasons.

Several limitations should be discussed before we draw conclusions. First of all, a prospective cohort study with one group is not the optimal design for evaluating an intervention. More reliable conclusions about effectiveness would be drawn in a randomised controlled trial (RCT).[14 15] Secondly, we were not able to examine STD incidence change by using incidental number of STD infection before the intervention. Nevertheless, information like the high prevalence of STD at baseline,[8] the decreasing trends of STD incidence rates during follow up period, and the decreasing trend of inconsistent condom use (an intermediate indicator of STD infection) at each visit suggest intervention had an impact on the STD incidence. Thirdly, since our study population was recruited by convenience sampling, it is unknown whether women who participated were more predisposed to change their behaviour than non-participants.[16] Therefore, generalisation of our findings to all sex workers in Guangzhou and other areas of China might be limited by potential selection bias. Fourthly, the low follow up rate is a weakness of this study, with only 512 (53%) of the 966 participants returning for three follow up visits after intake. However, although women who had completed three follow up visits differed at baseline in some characteristics from women who had not (table 1), the similar significant trends of sexual behaviour, consistent condom use, and STD incidence (except gonorrhoea) between these two groups of women suggests that the encouraging results we found are consistent. Since we did not find a significant decrease in gonorrhoea incidence among women with three follow up visits, it could be that women who had this STD infection for which symptoms are more serious, were more likely to return for follow up owing to a more pressing need for free STD care. Fifthly, being a short term intervention, the ability of this study to evaluate the longer term effect of the intervention is limited. Finally, although the importance of providing honest information was emphasised by the interviewers at each visit, the reliance on self reported sexual behaviour and condom use is another weakness common to many behaviour intervention studies. However, the self reports of increased condom use are in agreement with our finding of decreased STD incidence.

CONCLUSION

This study has confirmed our earlier finding that STD care and prevention programmes targeting sex workers are feasible in China. More importantly the results presented here provide evidence that an intervention consisting of preventive education and STD care is likely to reduce unprotected sexual behaviour and STD incidence in this group at high risk for HIV and other STD infection.

CONTRIBUTORS
SM performed statistical analyses and wrote the manuscript; NHTM substantially contributed to the interpretation of the results and drafting of the manuscript; AvdH and FY developed the research protocol; AvdH supervised the study and drafted the manuscript; FY supervised the study procedures on site; FY, CZ, FJ, ZL and ZX performed the medical examinations, interviewed the participants and entered the data in a database on site.

APPENDIX
Statements about AIDS (agree, disagree, or not sure):
(a) we can get AIDS from insect bites
(b) if a customer looks healthy, you cannot get AIDS from him
(c) if your sexual partner withdraws before ejaculating, you cannot get AIDS
(d) you can get AIDS by using the same toilet which is used by somebody with AIDS
(e) if you wash your vagina after your partner has ejaculated, you cannot get AIDS
(f) you can get AIDS from drinking from the glass used by somebody with AIDS
(g) you can get AIDS from having sexual intercourse with somebody with AIDS
(h) if you are pregnant, you can give AIDS to the baby
(I) if you take an AIDS test regularly, you can avoid getting AIDS

Statements on condom use (agree, disagree, not sure)
(a) condoms are protective against AIDS from sex
(b) if you use condoms correctly at all times, you cannot get AIDS from sex
(c) even if you use condoms, you can get AIDS from sex
(d) condoms are necessary to avoid STD
(e) using a condom is good for your hygiene

Self efficacy (scale categories: very capable, capable, sometimes capable, incapable, very incapable)
How capable are you:
(a) to talk about condom use with your customers
(b) to convince a customer to use condoms
(c) to refuse a customer who does not want to use condoms.

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Authors' affiliations
S Ma, N H T M Dukers, A van den Hoek, Cluster Infectious Diseases, Municipal Health Service, Amsterdam, Netherlands
F Yuliang, C Zhiheng, F Jiangting, Z Lina, Z Xiuxing, Maternal and Neonatal Hospital, Guangzhou, China
S Ma, Gansu Provincial Anti-Epidemic Station, Gansu, China

REFERENCES
1 **Chen X-S**, Gong X-D, Liang G-J, et al. Epidemiologic trend of sexually transmitted disease in China. Sex Transm Dis 2000,**27**:138–42.
2 **Cohen MS**, Gao P, Fox K, et al. Sexually transmitted diseases in the People's Republic of China in Y2K: back to the future. Sex Transm Dis 2000;**27**:143–5.
3 **Cohen MS**, Henderson GE, Aiello P, et al. Successful eradication of sexually transmitted diseases in the People's Republic of China: implications for the 21st century. J Infect Dis 1996;**174**(suppl 2):S223–9.
4 **Zheng Z**. Analysis of the epidemic of STD in China. Chin J Prev Control STD AIDS 1996;**2**:49–53.
5 **Liao S-S**. HIV in China: epidemiology and risk factors. AIDS 1998, **12**(suppl B):S19–25.
6 **Zhang K**, Li D, Li H, et al. Changing sexual attitudes and behavior in China: implications for the spread of HIV and other sexually transmitted diseases. AIDS Care 1999;**11**:581–9.
7 **Xinha S**, Junhua N, Qili G. AIDS and HIV infection in China. AIDS 1994,**8**(suppl 2):S55–9

8 **Van den Hoek A**, Yuliang F, Dukers HTM, *et al*. High prevalence of syphilis and other STD among sex workers in China: potential for fast spread of HIV. *AIDS* 2001;**15**:753–9.

9 **Norusis MJ**. *SPSS 7.5 for windows: user's guide.* Chicago, IL: SPSS, Inc,1997.

10 **Liang K-Y**, Zeger S. Longitudinal data analysis using generalized linear models. *Biometrika* 1986;**73**:13–22.

11 **SAS Institute**. SAS/STAT Software. Changes and enhancements Cary, USA: SAS Institute Inc, 1996.

12 **Laga M**, Alary M, Nzila N, *et al*. Condom promotion, sexually transmitted diseases treatment, and declining incidence of HIV-1 infection in female Zairian sex workers. *Lancet* 1994;**344**:246–8.

13 **Bai H**, Bo N, Huan L, *et al*. Prevalence of genital Chlamydia trachomatis infection in selected populations in China. *Sex Transm Dis* 1995;**22**:383–4.

14 **Artz L**, Macaluso M, Brill I, *et al*. Effectiveness of an intervention promoting the female condom to patients at sexually transmitted disease clinics. *Am J Public Health* 2000;**90**:237–44.

15 **Oakley A**, Fullerton D, Holland J. Behavioral interventions for HIV/AIDS prevention. *AIDS* 1995,**9**:479–86.

16 **Merson MH**, Dayton JM, O'Reilly K. Effectiveness of HIV prevention interventions in developing countries. *AIDS* 2000,**14**(suppl 2):S68–84.

ECHO ....

Larger dose of medicine

Please visit the Sexually Transmitted Infections website [www. sextransinf.com] for link to this full article.

Antiretroviral therapy (ART) with three agents or more protects children best against progression to AIDS, a study from Spain has discovered. In this first observational study "real life" performance mirrored that in clinical trials.

The researchers followed clinical progression to AIDS retrospectively in children infected with HIV at birth. The children were grouped by treatment: no treatment (58); treatment with one HIV-1 reverse transcriptase inhibitor (NRTI) (36); dual treatment with two NRTIs (31); or potent treatment with two NRTIs plus one or two HIV protease inhibitors (25). Another cohort—of 61 children aged >2 years—were grouped similarly (no treatment (13); one NRTI (16); dual treatment (15); or potent treatment (17)) and monitored quarterly for up to 18 months to determine the behaviour of major markers of progression—plasma viral load and proportions of CD4+ and CD8+ lymphocytes.

Potent ART and dual treatment protected best, with none and only two children respectively showing progression to AIDS after 30 months. In just three months potent ART produced a significant increase in mean percentage of CD4+ lymphocytes/year and decrease in mean $\log_{10}$ viral load compared with baseline values. Overall, potent ART resulted in a mean difference of 8 units of percentage CD4+ lymphocytes/year and a mean difference of −0.65 $\log_{10}$ viral load/year — significantly better than the other treatments. It also showed greatest protection in maintaining the favourable values for both markers.

Encouraging results, but, say the researchers, other effective treatments for reducing viral load and boosting CD4+ lymphocyte numbers are still needed.

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