Is ABC enough to explain changes in HIV prevalence in rural Uganda?

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Abstract

In Uganda the HIV prevalence declined from 1996. At the same time HIV prevention campaigns stressed Abstinence, Being faithful and using Condoms (ABC). We used annual survey data from 1997 to 2007 and defined 5-year birth cohorts. We assessed changes in age at first sex, proportion sexually active in the past year, average number of sexual partners in past year, and proportion that used condoms at last sex. For all parameters and in both sexes increasing age brought changes in sexual behaviour. For both males and females, later birth cohorts (born after 1985) had later age at first sex, compared to those born earlier, but there was no change in the proportion sexually active in the past year, or the number of sexual partners reported in this population. Changes in sexual behaviour have contributed to the decline in HIV prevalence in Uganda, although we need to go beyond ABC to reduce prevalence further.

Introduction.

In Uganda HIV prevalence peaked in the mid-1990s, with a prevalence of 30% in Kampala recorded in 1993 [1]. After the mid-1990s a dramatic decline in the HIV prevalence was observed [2,3]. At the same time Uganda engaged in an AIDS prevention campaign stressing the need for Abstinence, Be faithful and Condoms (ABC). Several papers have drawn attention to the association between the decline in the HIV prevalence and the increased awareness of HIV/AIDS in Uganda, and observed behaviour change [4-6]. Recently some commentators have worried that the increase in the HIV prevalence in Uganda could be due to more risky behaviour in the general population [7].

However in order to show a causal link between the HIV prevention message and subsequent infection with HIV, it is necessary to show two things. Firstly we need to show that changes in behaviour occurred that are consistent with the prevention messages. Secondly the sequence of events needs to be correct with the behaviour changes happening after the prevention campaign, and before the changes in HIV prevalence. Thirdly we need to consider alternative causes of the behaviour change, and the role these may have played in reducing HIV prevalence. If we can answer these questions we can determine the role the ABC campaign had in bringing down the prevalence of HIV in Uganda.

To answer these questions we have used data from a long standing cohort, which has collected data on sexual behaviour over the period from 1990 through to 2007. In both sexes, the incidence of HIV peaked in the mid-1990's (For females peaking at 10.2 per 1000 person-years in 1994, and for males peaking at 8.1 per 1000 person years in 1995), since then it has declined to 2005, and stabilised around 3 per 1000 person-years in both sexes. We can define behaviour associated with abstinence, partner reduction and condom use, and use these to assess whether and when changes occurred.

Methods

We have used longitudinal data from an open cohort in rural Uganda with annual demographic and serological surveys, which has been described elsewhere [5,6]. Data were available from the start of the cohort 1989, through to 2007. Sexual behavior data on the age at first sex, the number of sexual partners in the past 12 months, and condom use, were collected in a consistent order within the structured questionnaire in 10 survey rounds between 1996 and 2007.

For each respondent, 5-year birth cohorts were defined, with the earliest cohort extended to include all respondents born before 1960. The age at the survey was recorded, using date of birth where possible, and self-reported age if not, and all those aged 65 years or more are grouped at the age of 65 years. Data were analysed for each sex separately. For these analyses, all study participants aged 13 years and above were used, including those who had never had sex (virgins), and those abstaining from sex for any reason, including post-partum

abstinence. For each outcome, reports from all surveys were aggregated and summary parameters estimated for each age (in single years).

The reported number of sexual partners in the past year was truncated at 30, to reduce the impact of outliers on the estimates. The mean number of sexual partners was calculated for year of age within each birth cohort. For the other parameters, proportions were calculated for each year of age, within each birth cohort. To report the proportion who practise abstinence (either primary or secondary abstinence), we show the proportion reporting having had sex in the past year (defined as having at least one sexual partner during the past 12 months). To report the use of condoms in this population we show the proportion of those who reported using a condom at the last sexual intercourse. To report the age at first sex, we show the proportion of young people, aged between 13 and 25 years of age, who reported being sexual experienced (ever had sex). All results are presented graphically, by birth cohort, and by single year of age. Differences between birth cohorts were explored using linear regression of the means or proportions, and adjusting for the effects of age.

Results

Five birth cohorts (with the oldest cohort born in 1970-1974) contributed to the analysis of age at first sex, which was restricted to those aged between 13 and 25 years of age at the time the data were collected (Fig 1). There was no significant difference ($p=0.5$ for males, $p=0.6$ for females) in the reported age at first sex among the first three cohorts - born between 1970 through to 1985 – with a 50% of males reporting sexual debut by 18 years of age, and 50% of females by 17 years of age. For both sexes, the cohorts born in 1985 to 1989 were significantly older when 50% or more first reported sexual debut: 19 years for males ($p<0.001$) and 18 years for females ($p<0.01$). Although the oldest in the birth cohort born in 1990-1995 are only 17 years at the end of this analysis, both males ($p<0.001$) and females ($p=0.01$) show even lower proportion reporting sexual debut at young ages compared to the older birth cohorts.

Fig 1. The proportion who reported having started sex by 5 year birth cohort and age.

All study subjects from all birth cohorts were included in the estimation of the proportion who were sexually active in the last year. The proportion who are not sexually active are those who are practising abstinence for the past year. Around 90% of males aged 25 to 30 years were sexually active in the past year, with the proportion declining with increasing age, to around 70% at the age of 60 years (Fig 2). For females, over 90% of those aged between 20 and 30 years were sexually active in the past year, with the proportion declining with increasing age to about 50% at the age of 50 years (Fig 2).

For both sexes, across the ages, there was little difference in the proportion who were sexually active between the birth cohorts born before 1985 (p=0.2 for males, p=0.1 for females). However in the birth cohorts born after 1985, who had delayed the start of sexually activity, the proportion who were sexually active was lower by 7-10% in males (p=0.002) and 6% in females (p=0.001). At any age, the older birth cohorts would have been seen at the beginning of the time period (1996/1997), and the younger birth cohorts would have been see at the end of the study period (2006/2007).

Fig 2. The proportion of males and females who were sexually active in the past year, by birth cohort and age.

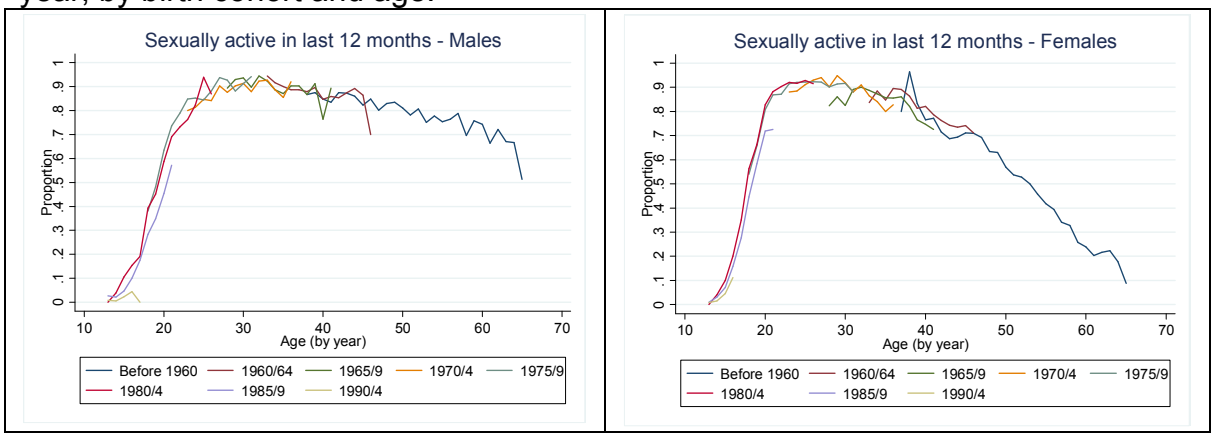
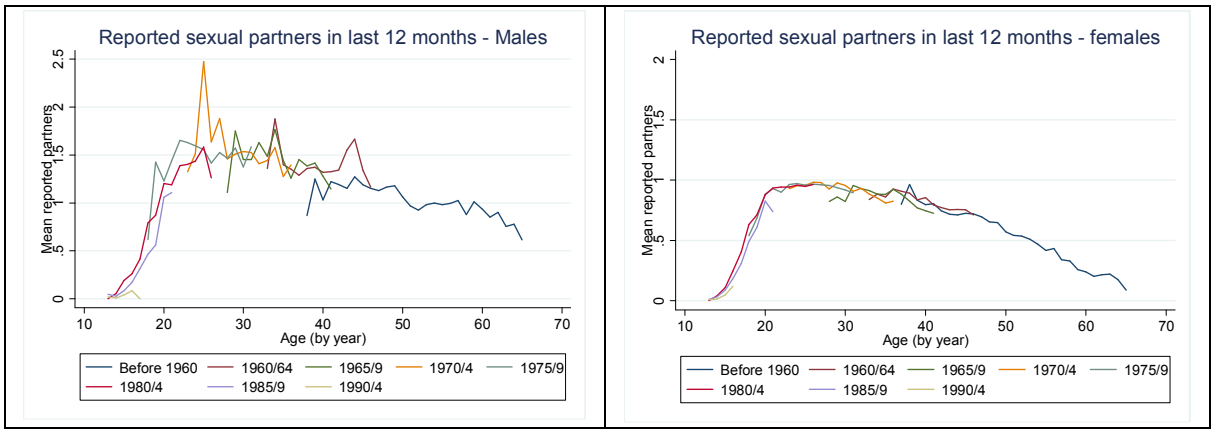


Fig 3. The mean number of sexual partners by sex, birth cohort and age.



The mean number of sexual partners shows very consistent reporting by females at all ages across all birth cohorts (fig 3). In females born before 1985, there were no significant differences in the number of sexual partners reported after adjusting for age (p=0.3). However females in the birth cohorts born after 1985 reported around 7% fewer partners than females in the older birth cohorts at the same age (p=0.004).

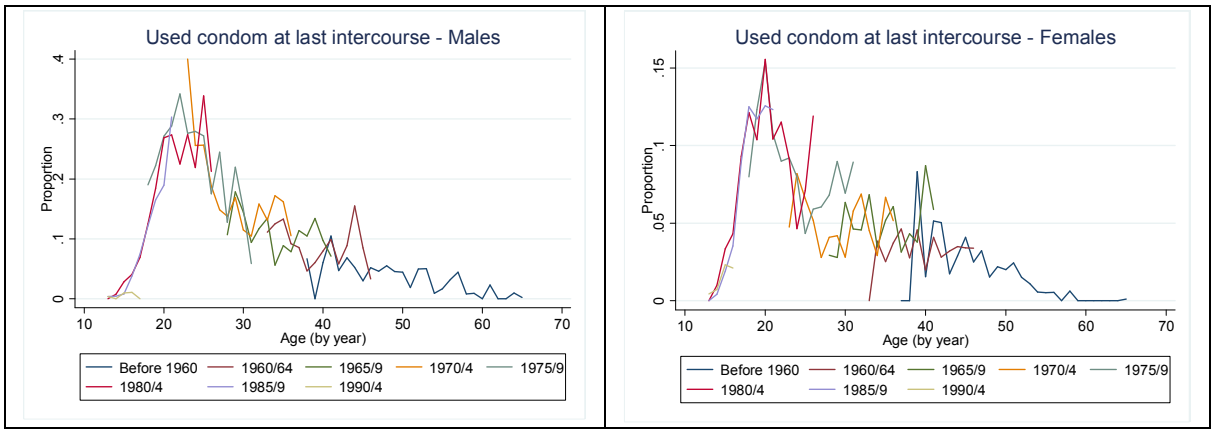
For males there is some variability in the number of sexual partners between birth cohorts (Fig 3), with significant differences among the birth cohorts born before 1985 (p=0.002). However males in the birth cohorts born after 1985 reported around 13% fewer partners than males in the older birth cohorts at the same age (p<0.001).

All study subjects were analysed for condom use at last sex (Fig 4). There are large differences by age, with more than a quarter of males aged 20 to 25 years of age reporting condom use at last sex, but dropping to below 10% of males aged 40 and above. For females more than 10% report condom use at last sex at the ages of 18 to 22 years, but this drops to below 4% at the age of 40 years or more.

Among males born before 1985, there is some evidence of an increase in the proportion who used condoms at last sex (p=0.07). However there is no evidence that condom use at last sex differs among the birth cohorts born after 1980 (p=0.4). The main difference is between the males in the age groups between 20 and 30 years, and those in the older age groups (>30 years) regardless of the birth cohort.

Among females born before 1985 there is stronger evidence of an increase in the proportion who used condoms at last sex (p=0.002), with about 3% increase in the proportion using condoms for every 10 years later in birth cohort. However there is no evidence that condom use at last sex differs among the female birth cohorts born after 1980 (p=0.8).

Fig 4. Proportion using condom at last sex by sex, birth cohort and age.



Discussion.

Uganda's AIDS control program was set up in the late 1980's concentrating on messages on Abstinence, Be faithful and Condom use. The prevalence of HIV declined dramatically during the last 1990's. Several commentators have associated the drop in HIV prevalence and the success of the HIV prevention campaign [4,8]. However others have argued that other factors may have contributed to the reduction in HIV, including the deaths of those infected, and the natural course of the epidemic [9].

Boys and girls born after 1980 would be making their sexual debut during the period of this study (1996 to 2007). These data show that these young people have delayed sexual debut, and taken a year longer before that have initiated sex. A similar picture emerges for secondary abstinence where older people have shown little change in the proportion that are sexually active in the past year. However, up to 10% fewer of the younger cohorts (born after 1980) are reporting to be sexually active in the past year compared to those born before 1980. The picture for the number of sexual partners is more complex, but there is little evidence that there has been any reduction in the number of sexual partners reported by males or females born before 1980. The most consistent picture is of the use of condoms by younger males and younger females compared to older age groups, which probably associates with the sexual experimentation prior to marriage, and the increased need to prevent pregnancy at younger ages.
The patterns of condom use at last sex, over birth cohort and the life course may be consistent with increased condom use in later birth cohorts where there is evidence for simultaneous partner reduction. Condom use at last sex is most influenced by sex with the most frequent partner, for most people a spouse or boy or girlfriend. These are the partners with which condoms are least often used, in many cases because of a wish to conceive. If partner reduction leads to fewer casual partners, and perhaps a shift towards regular partners and less need for condom use, then a stable, or lower proportion of condom users does not necessarily mean no change in this behaviour.

While these data show that behaviour changes expected from the health promotion campaign have materialised, and therefore could have partially explained the drop in HIV prevalence in the late 1990's, other factors also contributed to the decline in the prevalence of HIV, including the large number of HIV related deaths during the 1990's and the natural cycle of the HIV epidemic [9]. However behaviour changes have also had beneficial effects on the incidence of sexually transmitted infections (STI) in Uganda [10]. Others have shown that even small behaviour changes could have substantial effects on the transmission of HIV and STI by reducing the size of sexual networks [11]. Mathematical models have been used to show the importance of the well designed behaviour change campaign in Uganda in reducing the overall prevalence of HIV [12].

However in recent years some have shown that HIV prevalence in Uganda is no longer falling [7], and more recently that sexual behaviour is beginning to change for the worse [13]. We need to maintain the monitoring of the trends in HIV prevalence and incidence in Uganda, and couple this with active monitoring of the sexual behaviours reported in the same population. More than that we need to ensure that consistent and continuous HIV prevention messages are delivered, that agree with people's own experience of the epidemic, in order to maximise the impact on HIV incidence.

References:

1. HIV/AIDS Surveillance Report, STD/AIDS Control Programme, Ministry of Health, Uganda, June 2001.
2. Mbulaiteye SM, Mahe C, Whitworth JAG, Ruberantweri A, Nakinyingi J, Ojwiya A, Kamali A. Declining HIV-1 incidence and associated prevalence over 10 years in a rural population in south-west Uganda: a cohort study. Lancet 2002;360:41-46.
3. Mulder D, Nunn A, Kamali A, Kengeya-Kayondo J. Decreasing HIV-1 sero-prevalence in young adults in a rural Ugandan cohort. *BMJ* 1995; **311:** 833–36.
4. Stoneburner RL, Low-Beer D. Population-level HIV declines and behavioral risk avoidance in Uganda. *Science* 2004;304(5671):714-8.
5. Kilian AH, Gregson S, Ndyanabangi B, et al. Reductions in risk behaviour provide the most consistent explanation for declining HIV-1 prevalence in Uganda. *AIDS* 1999; **13:** 391–98.
6. Asiimwe-Okiror G, Opio AA, Musinguzi J, Madraa E, Tembo G, Carael M. Change in sexual behaviour and decline in HIV infection among young pregnant women in urban Uganda. *AIDS*. 1997;11(14):1757-1763.
7. Shafer LA, Biraro S, Nakiyingi-Miiro J, Kamali A, Ssematimba D, Ouma J, Ojwiya A, Hughes P, Van der Paal L, Whitworth J, Opio A, Grosskurth H: HIV prevalence and incidence are no longer falling in Southwest Uganda: Evidence from a Rural Population Cohort 1989 – 2005. AIDS 2008; 22 (13): 1641-9.
8. STD/AIDS control programme (2002). Trends in HIV prevalence and sexual behavior (1990-2000) in Uganda.
9. Wawer M, Gray R, Serwadda D, Namukwaya Z, Makumbi F, Sewankambo N, Li X, Lutalo T, Nalugoda F, QuinnT. Declines in HIV prevalence in Uganda: Not as simple as ABC. Croi 2005 12th conference on retroviruses and opportunistic infections.
10. Ahmed S, Lutalo T, Wawer M, et al. HIV incidence and sexually transmitted disease prevalence associated with condom use: a population study in Rakai, Uganda. *AIDS*. 2001;15(16):2171-2179.
11. Kirby D. Changes in sexual behaviour leading to the decline in the prevalence of HIV in Uganda: confirmation from multiple sources of evidence. Sex Transm Infect. 2008 Oct;84 Suppl 2:ii35-41.
12. Slutkin G, Okware S, Naamara W, Sutherland D, Flanagan D, Careael M, Blas E, Delay P, Tarantola D. How Uganda reversed its HIV epidemic. AIDS Behav 2006;10:351-361.
13. Biraro S, Shafer LA, Kleinschmidt I, Wolff B, Karabalinde A, Nalwoga A, Musinguzi J, Kirungi W, Opio A, Whitworth J, Grosskurth H. Is sexual risk taking behaviour changing in rural south-west Uganda? Behaviour trends in a rural population cohort 1993-2006. Sex Transm Infect. 2009 Apr;85 Suppl 1:i3-11.