Temporal Dynamics of Religion as a Determinant of HIV Infection in East Zimbabwe: A Serial Cross-Sectional Analysis

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Abstract

Background: Religion is an important underlying determinant of HIV spread in sub-Saharan Africa. However, little is known about how religion influences changes in HIV prevalence and associated sexual behaviours over time.

Objectives: To compare changes in HIV prevalence between major religious groups in eastern Zimbabwe during a period of substantial HIV risk reduction (1998–2005) and to investigate whether variations observed can be explained by differences in behaviour change.

Methods: We analysed serial cross-sectional data from two rounds of a longitudinal population survey in eastern Zimbabwe. Univariate and multivariate logistic regression models were developed to compare differences in sexual behaviour and HIV prevalence between religious groups and to investigate changes over time controlling for potential confounders.

Results: Christian churches were the most popular religious grouping. Over time, Spiritualist churches increased in popularity and, for men, Traditional religion and no religion became less and more common, respectively. At baseline (1998–2000), HIV prevalence was higher in Traditionalists and in those with no religion than in people in Christian churches (men 26.7% and 23.8% vs. 17.5%, women: 35.4% and 37.5% vs. 24.1%). These effects were explained by differences in socio-demographic characteristics (for Traditional and men with no religion) or sexual behaviour (women with no religion). Spiritualist men (but not women) had lower HIV prevalence than Christians, after adjusting for socio-demographic characteristics (14.4% vs. 17.5%, aOR = 0.8), due to safer behaviour. HIV prevalence had fallen in all religious groups at follow-up (2003–2005). Odds of infection in Christians reduced relative to those in other religious groups for both sexes, effects that were mediated largely by greater reductions in sexual-risk behaviour and, possibly, for women, by patterns of conversion between churches.

Conclusion: Variation in behavioural responses to HIV between the major church groupings has contributed to a change in the religious pattern of infection in eastern Zimbabwe.

Introduction

Religion can help shape the behavioural norms within a society and the behaviours and practices of individuals. Differences in religious composition, therefore, may contribute to the differences in the spread of HIV infection that have been observed between and within countries in sub-Saharan Africa. In particular, religious beliefs and teachings may act as social enablers that facilitate the spread and adoption of messages promoted by national AIDS control programmes or, in some cases, may act as barriers to the adoption of these messages.

In Zimbabwe, HIV prevalence has fallen substantially from a peak of 27% in 1997 to around 14% currently. This decline has been shown to have resulted from reductions in sexual risk behaviour (mainly multiple sexual partners) occurring most rapidly between 1998 and 2005. These reductions in risk behaviour have, in turn, been attributed to increased awareness of AIDS deaths backed up by community-based HIV prevention programmes using school, workplace, church, peer education and other inter-personal communication activities. For example, showed that women who attended their local community group meetings (including church meetings) were more likely to have adopted lower-risk behaviours.

Numerous different churches exist within Zimbabwe, which vary in their beliefs, teachings, and practices on sexual, and health-seeking behaviour. It is important to establish whether there have been differences in the extent to which the HIV epidemic has affected members of these churches or in the extent...
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Methods

Data Source

The Manicaland HIV/STD Prevention Study (Manicaland Study) is a prospective general population cohort survey tracking trends in the HIV epidemic in twelve sites spread across three districts in Manicaland, Zimbabwe’s eastern province. The twelve sites represent four of the main socio-economic strata in Zimbabwe – small towns (2 sites), agricultural estates (4), roadside settlements (2) and subsistence farming areas (4) – and are enumerated in each round of the survey in a phased manner (one at a time) over periods of 18 months to two years. In each round, the data collected include information on socio-demographic characteristics and sexual behaviour. Dried blood spot specimens were collected and tested for the presence of HIV infection. Eligibility criteria included males aged 17–54 and females aged 15–44. Only one member of each cohabiting marital couple was selected at random. Participants were required to have stayed four nights in the household for the past month and at the same time one year ago. Further details of the survey methods are available in previous publications. [10,16].

We used data from the baseline survey and the second follow-up survey of the Manicaland Study, which were collected between July 1998 and February 2000 and between July 2003 and August 2005, respectively. These rounds were selected because they spanned the period of greatest reduction in sexual risk behaviour in Manicaland [10] and in Zimbabwe in general [11,12] and, therefore, provided an opportunity to compare changes in HIV infection and associated risk behaviours over time between religious groupings.

In the Manicaland Study, each participant was asked to identify the church that they belonged to. Churches identified in this way were then allocated to major religious groupings based on a categorization developed from the literature and using qualitative data collected in in-depth interviews carried out with 5 key informants in Zimbabwe. The key informant interviews were relatively brief, lasting approximately 15–30 minutes each. The key informants were leaders from the Evangelical Fellowship of Zimbabwe (a Pentecostal inter-denominational organization); the Scripture Union (an international Christian organization); the Africa Leadership and Management Academy (a Christian based college); Zimbabwe Assemblies of God Africa (ZAGO) (a large local Pentecostal church); and Faith Ministries (another local Pentecostal church). These key informants were selected to provide a cross-section of the influential Christian-based church organizations in Zimbabwe. We were unable to interview leaders from Traditional and Spiritual churches so key informants were selected who could provide informative insight into not only Christian religions but also on Traditional and Spiritual religions in Zimbabwe.

In this study, we use data from an on-going longitudinal survey in the Manicaland region of Zimbabwe to determine: (1) whether differences existed in HIV prevalence between major religious groupings at the start of the HIV decline in Zimbabwe, (2) whether these differences were mediated by differences in past sexual risk behaviour, and (3) whether differences in sexual behaviour change contributed to variation in reductions in HIV prevalence between religious groups during the period of most rapid HIV risk reduction (1998–2005).

Data Analysis

To investigate the contribution of people who converted from one church to another to changes in HIV prevalence in the religious groupings during the study period, the proportions of church members at follow-up who reported having joined their current church in the last 5 years were calculated for each major religious grouping, and HIV prevalence was compared for new and long-term members.

Previously, data from the Manicaland Study have shown that HIV risk differs between men and women and over time, [10,16]

Table 1. Principal teachings and practices of major religious groupings in Manicaland, Zimbabwe.

| Teaching or practice          | Traditional | Spiritual | Christian |
|-------------------------------|-------------|-----------|-----------|
| Weekly meetings               | No          | Yes       | Yes       |
| Bible-based teachings         | No          | Partial   | Yes       |
| Polygyny condoned             | Yes         | Some groups | No
| Alcohol consumption           | Yes         | No        | Partial   |
| Form of medicine              | Herbs/ancestral spirits | Faith healing | Western |
| Condom use                    | Indifferent | No        | Varies    |

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Results

Data were available on 4,418 and 6,609 men aged 17–54 years and on 5,424 and 9,893 women aged 15–44 years in the baseline survey (1998–2000) and the follow-up survey (2003–2005), respectively. The participation rates at baseline were 76% for men and 78% for women; at follow-up, the participation rates were 77% and 86%.

The degree of missing data was limited (<15%) for both males and females except for the number of lifetime sexual partners in the baseline survey, where up to 22% was missing.

Distribution of the Population between Religions

Figure 1 shows the distribution of churches at each round of the survey before they were combined into the five main religious groupings used for the study. The Anglican and Roman Catholic churches had the most members amongst the various Christian churches whilst no single church stood out amongst the Spiritualist churches.

In the late 1990s, Christian churches were the most popular religious grouping for both men (54%) and women (70%) (Table 2 & Table 3), Traditional religion was the second most common grouping amongst men (18%) followed by Spiritualist churches (13%) but, for women, Spiritualist churches were the second most common grouping (17%) and subscribers to Traditional religion were relatively few (3%). By the mid-2000s, membership of Christian churches had increased further in men (60%) but declined slightly amongst women (67%). However, Spiritualist churches had increased in popularity for both sexes (18% for men and 25%, for women). Only small numbers of participants in the follow-up survey reported subscribing to Traditional religion (3% of men; 2% of women) but there was an increase in the proportion of male respondents reporting no religious beliefs from 10% to 17%. However, none of the changes in religious groupings over time were statistically significant.

In the follow-up survey, amongst women, 26% of Christians, 56% of Spiritualists and 67% of members of other churches reported having joined their church in the last 5 years (i.e. since baseline) (Figure 2). Women who were converted to a Christian church were equally likely to have moved from another Christian church or a Spiritualist church (46% in each case), whilst those who were converted to a Spiritualist church were most likely to have moved from another Spiritualist church (54% vs. 36%). Marriage (36% for Christian churches and 22% for Spiritualist churches) and ‘better church beliefs’ (22% and 24%) were the most common reasons given for changing church. Sickness was cited more frequently as the main reason for changing church by women joining Spiritualist churches than by those joining Christian churches (10% vs. 2%).

Males in Spiritual churches were also more likely than those in Christian churches to have joined their church recently (49.4% vs. 21.0%). New members of both Christian and Spiritual churches were most likely to have joined from a Spiritual church (43% and 51%, respectively) and sizable proportions had previously had no religion (24% and 16%).

Comparison of the Socio-demographic and Behaviour Profiles of Members of Different Religions

For both sexes, subscribers to Traditional religion tended to be older than members of other religions, a difference that increased over time (Table 2 & Table 3). Marriage levels were high for both sexes across all religions.

For men, in the late 1990s, alcohol consumption was most common amongst those in Christian churches (21%) and with no religion (22%) and was least common amongst those in Spiritual churches (3%). By the mid-2000s, alcohol consumption had fallen amongst men in Christian churches (9%, p = 0.03) and was highest in men who followed the Traditional religion (19%, p = 0.6) (Table 2). For women, alcohol consumption was generally low with only a few of those subscribing to Traditional religion (3% at baseline) or with no religion (4%) reporting that they drank alcohol (Table 3).

Men following Traditional religion and men with no religion at baseline reported more sexual partners in their lifetime than those in Christian churches whilst men from Spiritual churches reported fewer partners than Christian men (Table 2). The men from all religions interviewed at follow-up reported smaller numbers of lifetime partners and fewer partners in the last 12 months than those interviewed at baseline. Men with no religion and those subscribing to Traditional religion continued to report more lifetime partners and reported more partners in the last 12 months than men from Christian churches. Men from Spiritual churches still reported fewer sexual partners over their lifetimes than those from Christian churches; however, Christian men now reported similar numbers of partners in the last 12 months to their Spiritualist counterparts.

As for men, women subscribing to Traditional religion and women with no religion reported higher numbers of partners than Christian women at baseline (Table 3). However, women from Spiritual churches reported similar numbers of partners to those from Christian churches. Again, lower numbers of sexual partners were reported in all religious groupings at follow-up. Women following Traditional religion and those with no religion continued to report higher numbers of past and recent partners than Christian women, whilst reported partner numbers in Christian and Spiritual churches remained similar.

For both men and women, those from Christian and Spiritual churches who reported non-regular sexual partners were equally likely to report consistent condom use (Table 2 & Table 3). Those following Traditional religion or with no religion reported somewhat higher condom use but the differences were not statistically significant.

Comparison of HIV Prevalence between Religious Groupings in the Late 1990s

At baseline, in the univariate analysis (Table 4), men subscribing to Traditional religion (26.7% vs. 17.5%, p<0.001) or with no religion (23.8% vs. 17.5%, p<0.05) were more likely to be infected with HIV than those in Christian churches, whilst HIV prevalence in men in Spiritual churches was borderline significantly lower (14.4% vs. 17.4%, p = 0.076). After controlling for socio-demographic confounding factors, the differences between Traditional and no religion compared to Christian religion were reduced and no longer statistically significant. However, the lower HIV prevalence associated with membership of a Spiritual church became more pronounced and statistically significant (aOR = 0.7; 95% CI 0.50–0.86). After further adjustment for differences in alcohol consumption and number of lifetime sexual partners, the protective effect of membership of a Spiritual church was reduced.
and ceased to be statistically significant (aOR = 0.8; 0.60–1.06) – suggesting that the lower levels of sexual risk behaviour in these churches had contributed to their lower HIV prevalence.

For women, as for men, the univariate results showed higher HIV prevalence amongst those following Traditional religion (35.4% vs. 24.1%, p<0.001) and those with no religion (37.5% vs. 24.1%, p<0.001) than for those in Christian churches (Table 5). These differences were reduced after adjusting for socio-demographic confounding factors but remained borderline statistically significant for Traditional religion (aOR = 1.4; 0.95–1.92) and significant for no religion (aOR = 1.5; 1.10–1.94). However, after further adjustment for sexual behaviour, the differences between women with no religion and those in Christian churches were reduced and ceased to be statistically significant (p = 0.4). Women in Spiritual churches had a similar HIV prevalence (25.6%) to women in Christian churches (24.1%), a pattern that was not affected by adjustment for differences in socio-demographic or behavioural characteristics (Table 5).

### Temporal Changes in Religion as a Determinant of HIV Infection

In the follow-up survey, HIV prevalence had fallen in all religious groupings for both sexes (Table 4 & Table 5). The drops in prevalence were greatest in Christians, such that, by the mid-2000s, levels of HIV infection in all other religious groups had increased relative to those in Christians.

In the univariate analysis, as in the late 1990s, men subscribing to Traditional religion (24.6%) and men with no religion (20.2%) had higher HIV prevalence than those in Christian churches (13.2%). However, the difference for Traditional religion ceased to be statistically significant after adjusting for differences in socio-demographic factors. For men in Spiritual churches, the lower HIV prevalence compared to men in Christian churches that had been seen at baseline was no longer present (Table 4).

Amongst women, in the mid-2000s, HIV prevalence remained highest in the Traditional religion (32.6% vs. 18.3% in Christian churches) and no religion (30.7%) groupings. As in the earlier period, these differences remained after accounting for differences in socio-demographic characteristics but ceased to be statistically significant after further adjustment for differences in sexual behaviour (Table 5). Unlike in the late 1990s, HIV prevalence in women in Spiritual churches was also higher than amongst women in Christian churches (21.6% vs. 18.3%, p = 0.001). The difference was reduced to borderline statistically significant after adjusting for differences in behaviour (aOR = 1.5; 95% CI 0.99–2.34).
| Characteristic                                      | 1998–2000 | 2003–2005 | 1998–2000 | 2003–2005 | 1998–2000 | 2003–2005 | 1998–2000 | 2003–2005 | 1998–2000 | 2003–2005 | 1998–2000 | 2003–2005 |
|----------------------------------------------------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|
| **Age-group**                                      |          |         |          |         |          |         |          |         |          |         |          |         |
| <25 years                                          | 33       | 34      | 34       | 33      | 29       | 29      | 125      | 125     | 59       | 55      | 48       | 48      |
| 25–34 years                                        | 27       | 26      | 34       | 33      | 33       | 31      | 33        | 32      | 29       | 29      | 29       | 28      |
| ≥35 years                                          | 40       | 40      | 48       | 53      | 49       | 50      | 100       | 100     | 26       | 27      | 23       | 24      |
| **Education**                                      |          |         |          |         |          |         |          |         |          |         |          |         |
| None/primary                                      | 51       | 51      | 50       | 51      | 49       | 50      | 113       | 113     | 25       | 26      | 26       | 27      |
| Secondary/higher                                  | 49       | 49      | 50       | 51      | 51       | 50      | 181       | 182     | 26       | 27      | 26       | 26      |
| **Marital status**                                |          |         |          |         |          |         |          |         |          |         |          |         |
| Single                                            | 31       | 31      | 30       | 29      | 30       | 30      | 108       | 109     | 28       | 29      | 28       | 28      |
| Married                                           | 61       | 61      | 60       | 60      | 60       | 60      | 297       | 296     | 62       | 62      | 62       | 62      |
| Divorced                                          | 3        | 3       | 3        | 3       | 2        | 2       | 11        | 11      | 2        | 2       | 2        | 2       |
| Widowed                                           | 9        | 9       | 9        | 9       | 9        | 9       | 78        | 78      | 8        | 8       | 8        | 8       |
| **Early marriage**                                 |          |         |          |         |          |         |          |         |          |         |          |         |
| Later marriage                                    | 91       | 91      | 91       | 91      | 91       | 91      | 269       | 269     | 91       | 91      | 91       | 91      |
| Early marriage                                    | 9        | 9       | 9        | 9       | 9        | 9       | 31        | 31      | 9        | 9       | 9        | 9       |
| **Drinks regularly**                              |          |         |          |         |          |         |          |         |          |         |          |         |
| No                                                 | 84       | 84      | 84       | 84      | 84       | 84      | 308       | 308     | 84       | 84      | 84       | 84      |
| Yes                                               | 16       | 16      | 16       | 16      | 16       | 16      | 20        | 20      | 16       | 16      | 16       | 16      |
| **No. of sexual partners in last 12 months**       |          |         |          |         |          |         |          |         |          |         |          |         |
| 0                                                 | 15       | 15      | 15       | 15      | 15       | 15      | 25        | 25      | 15       | 15      | 15       | 15      |
| 1                                                 | 44       | 44      | 44       | 44      | 44       | 44      | 126       | 126     | 44       | 44      | 44       | 44      |
| 2                                                 | 38       | 38      | 38       | 38      | 38       | 38      | 105       | 105     | 38       | 38      | 38       | 38      |
| 3                                                 | 12       | 12      | 12       | 12      | 12       | 12      | 48        | 48      | 12       | 12      | 12       | 12      |
| 4                                                 | 4        | 4       | 4        | 4       | 4        | 4       | 14        | 14      | 4        | 4       | 4        | 4       |
| **Condom use with non-regular partner**            |          |         |          |         |          |         |          |         |          |         |          |         |
| Never                                             | 64       | 64      | 64       | 64      | 64       | 64      | 296       | 296     | 64       | 64      | 64       | 64      |
| Less than a year                                   | 13       | 13      | 13       | 13      | 13       | 13      | 36        | 36      | 13       | 13      | 13       | 13      |
| More than a year                                   | 22       | 22      | 22       | 22      | 22       | 22      | 68        | 68      | 22       | 22      | 22       | 22      |
| Abstinence                                         | 28       | 28      | 28       | 28      | 28       | 28      | 201       | 201     | 28       | 28      | 28       | 28      |
| Less than a year                                   | 6        | 6       | 6        | 6       | 6        | 6       | 12        | 12      | 6        | 6       | 6        | 6       |
| More than a year                                   | 22       | 22      | 22       | 22      | 22       | 22      | 187       | 187     | 22       | 22      | 22       | 22      |
Table 3. Socio-demographic and sexual behaviour profiles of religious groups in 1998–2000 and in 2003–2005 in Manicaland, Zimbabwe: females.

| Characteristic                         | Traditional 1998–2000 | 2003–2005 | Spiritual 1998–2000 | 2003–2005 | Other 1998–2000 | 2003–2005 | None 1998–2000 | 2003–2005 | Christian 1998–2000 | 2003–2005 |
|----------------------------------------|-----------------------|-----------|---------------------|-----------|-----------------|-----------|----------------|-----------|-----------------------|-----------|
| Age-group                              |                       |           |                     |           |                 |           |                 |           |                       |           |
| <25 years                              | 41                    | 70        | 32                  | 39        | 47              | 37        | 44             | 94        | 46                    | 142       |
| 25–34 years                            | 34                    | 59        | 35                  | 44        | 31              | 31        | 249            | 35        | 35                    | 754       |
| ≥35 years                              | 25                    | 43        | 33                  | 41        | 22              | 37        | 173            | 72        | 21                    | 452       |
| Education                              |                       |           |                     |           |                 |           |                 |           |                       |           |
| None/primary                           | 76                    | 136       | 57                  | 64        | 58              | 46        | 490            | 46        | 1067                  | 43        |
| Secondary/higher                      | 24                    | 42        | 43                  | 49        | 42              | 27        | 352            | 27        | 1239                  | 25        |
| Marital status                         |                       |           |                     |           |                 |           |                 |           |                       |           |
| Single                                 | 10                    | 17        | 12                  | 17        | 21              | 27        | 177            | 27        | 469                   | 28        |
| Married                                | 64                    | 114       | 66                  | 94        | 60              | 53        | 501            | 53        | 1479                  | 57        |
| Widowed                                | 8                     | 15        | 10                  | 15        | 6               | 12        | 55             | 12        | 225                   | 8         |
| Early marriage/*                       | 94                    | 152       | 100                 | 125       | 98*             | 98        | 649            | 98*       | 1940                  | 98*       |
| Early marriage/*                       | 6                     | 9         | 0                   | 0         | 2               | 2         | 16             | 2         | 27                    | 2         |
| Drinks regularly                       |                       |           |                     |           |                 |           |                 |           |                       |           |
| Never                                  | 97                    | 171       | 98                  | 140       | 99              | 99        | 837            | 99        | 2433                  | 99        |
| Yes                                    | 3                     | 5         | 2                   | 3         | 1               | 2         | 4              | 1         | 2                     | 1         |
| Lifetime partners                      |                       |           |                     |           |                 |           |                 |           |                       |           |
| 1                                      | 60                    | 96        | 61                  | 79        | 64*             | 19        | 435            | 129       | 57*                   | 139       |
| 2                                      | 17                    | 27        | 25                  | 32        | 19              | 25        | 126            | 335       | 25                    | 62        |
| 3                                      | 8                     | 13        | 5                   | 6         | 8               | 2         | 57             | 98        | 8                     | 20        |
| 4+                                     | 15                    | 24        | 9                   | 12        | 9               | 9         | 62             | 69        | 9                     | 23        |
| No. of sexual partners in last 12 months |                       |           |                     |           |                 |           |                 |           |                       |           |
| 1                                      | 14                    | 23        | 25                  | 36        | 14              | 19        | 99             | 80        | 35                    | 46        |
| 2+                                     | 7                     | 11        | 4                   | 5         | 5               | 4         | 33             | 39        | 4                     | 10        |
| Condom use with non-regular partner    |                       |           |                     |           |                 |           |                 |           |                       |           |
| Never                                  | 42*                   | 5         | 67                  | 127       | 79              | 59        | 15             | 58        | 52                    | 67        |
| Less than a year                       | 0                     | 0         | 7                   | 13        | 5               | 5         | 1              | 5         | 4                     | 6         |
| More than a year                       | 58                    | 7         | 26                  | 50        | 16              | 16        | 3              | 3         | 37                    | 33        |
| Abstinence                             |                       |           |                     |           |                 |           |                 |           |                       |           |
| Never had sex                          | 8                     | 13        | 9                   | 13        | 17              | 21        | 150            | 391       | 21                    | 62        |
| Abstaining                             | 26                    | 43        | 33                  | 46        | 26              | 27        | 228            | 699       | 27                    | 80        |
| Not abstaining                        | 61                    | 102       | 58                  | 81        | 55              | 48        | 472            | 1287      | 48                    | 144       |
| Distribution of religions              |                       |           |                     |           |                 |           |                 |           |                       |           |
| 3                                      | 3                     | 178       | 2                   | 143       | 17              | 9        | 842            | 2436      | 5                     | 316       |
| 0.001.                                 |                       |           |                     |           |                 |           |                 |           |                       |           |
| *p<0.05.                               |                       |           |                     |           |                 |           |                 |           |                       |           |

**Distribution of religions:** 3 = 1.78, 2 = 1.43, 1 = 1.2, 0 = 0.0.

**Variables converted to binary variables:**
- Lifetime sexual partners: 1&2 versus 3+
- No. of sexual partners in 12 months: 0&1 versus 2+
- Condom use: never and less than a year vs. more than a year.

**Difference in behaviour variable in religious group versus Christians adjusted for age using logistic regression. Variables converted to binary variables:**
- Lifetime sexual partners: 1&2 versus 3+
- No. of sexual partners in 12 months: 0&1 versus 2+
- Condom use: never and less than a year vs. more than a year.

**Married before age 18 years.**

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Comparison of HIV Prevalence between New and Long-term Church Members

Women who had joined a church in the last 5 years were more likely to be infected with HIV than long-term members after adjusting for differences in age, education, and marital status (20.4% vs. 19.9%, aOR = 1.32; 95% CI 1.15–1.51). This effect was seen in both Christian (18.5% vs. 17.8%, 1.26; 1.06–1.51) and Spiritualist churches (23.2% vs. 16.9%, 1.42; 1.11–1.81) and for all churches of origin (Figure 2).

For men, no differences were observed in HIV prevalence between new and long-term members, for any of the major religious groupings, after adjusting for differences in age, education and marital status (results not shown).

Discussion

In eastern Zimbabwe, most men and women belong to orthodox Christian churches. This pattern continued during the early-mid 2000s, but membership of Spiritual churches increased and Traditional religion reduced in popularity (the latter, mainly due to population ageing).

In the late 1990s, we found that, for both men and women, Traditional religion and having no religious affiliation were associated with greater odds of being infected with HIV than belonging to a Christian church, whilst being a member of a Spiritualist church was protective for men and carried similar odds of HIV infection to Christian churches for women. The fall in HIV prevalence for both sexes in Manicaland over the subsequent five years [10] was observed in all religious groupings. However, the largest proportionate declines in HIV prevalence were recorded in Christian churches. As a consequence, membership of Christian churches became increasingly protective relative to other church groupings, with the initial advantage found amongst men in Spiritualist churches disappearing and women in these churches now suffering greater odds of HIV infection than women in Christian churches.

Most of the variation in HIV prevalence between religious groupings and over time was explained by differences in the socio-demographic characteristics of church members or by differences in levels and changes in sexual risk behaviour. In particular, the protective effect of membership of Spiritualist churches, found for men at the end of the 1990s, was accounted for by smaller numbers of lifetime sexual partners; whilst the reduction in this effect in the early-mid 2000s reflected greater declines within Christian churches in the rate of sexual partner acquisition over the subsequent five years.

These variations in sexual behaviour and in rates of reduction in risk behaviour, in turn, may be shaped by differences in church norms and teachings. For example, the smaller reduction in HIV risk behaviour found amongst Traditionalists could reflect health beliefs founded on Ancestral spirits and witchcraft – rather than Western explanations of sickness – and the central role of polygyny within Shona religion. [14] Polygyny is not approved of in Christian churches but, in Traditional religion and Spiritual churches, polygyny is widely accepted and sometimes encouraged. [18] Historically, polygyny was practical in that it ensured that a family had many children that could be used as labour to work on their land. [14] In recent times, levels of formal polygyny have been eroded by western Christian teachings, socio-economic development and other factors, although new forms have evolved such as the phenomena of ‘small houses’ in Zimbabwe. [19]

We have suggested previously that strictly enforced church rules prohibiting extra-marital sexual partnerships and alcohol consumption could provide protection against HIV infection within Spiritualist churches in Zimbabwe, even where polygyny continues to be practiced. [18] The main Spiritualist group in Manicaland that practices polygyny (the African Apostolic Church of Johane Marange) was not represented in the current study since church rules barred members from providing the dried blood spot samples required for HIV testing. Nevertheless, greater tolerance of polygyny together with underlying religious beliefs in the power of faith healing – rather than traditional or modern medicine – which are shared by most Spiritualist churches, may have restricted the reductions in numbers of sexual partners that occurred within these churches. In contrast, many Christian churches – particularly those with Missionary origins – are linked to provision and promotion of Western health beliefs and medicine including treatment of sexually transmitted infections. These churches are closely involved in national HIV control programmes and their teachings prohibiting or discouraging unfaithfulness and...
### Table 4. Comparison of HIV prevalence between religions over time, Manicaland, Zimbabwe: univariate and nested multivariate regression models for 1998–2000 and 2003–2005: males.

| Characteristic                  | Coding   | 1998–2000 | 2003–2005 | 1998–2000 | 2003–2005 | 1998–2000 | 2003–2005 | 1998–2000 | 2003–2005 |
|--------------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                                |          | OR        | p-value   | HIV+ (%)  | OR        | p-value   | HIV+ (%)  | aOR       | p-value   |
| Religion                       | Traditional | 1.7       | <0.001    | 26.7%     | 2.1       | 0.393     | 24.6%     | 1.2       | 0.160     |
|                                | Spiritual  | 0.8       | 0.076     | 14.4%     | 1.0       | 0.094     | 12.7%     | 0.7       | 0.002     |
|                                | Other     | 0.8       | 0.354     | 15.0%     | 1.0       | 0.979     | 13.0%     | 0.8       | 0.334     |
|                                | None      | 1.5       | 0.002     | 23.8%     | 1.7       | 1.662     | 20.2%     | 1.3       | 0.077     |
|                                | Christian | 1         | 19.5%     | 1         | 1         | 13.2%     | 1         | 1         | 1         |
| Age-group                      |          |           |           |           |           |           |           |           |           |
|                                | <25 years |           |           |           |           |           |           |           |           |
|                                | >35 years |           |           |           |           |           |           |           |           |
|                                | Education | None/primary |           |           |           |           |           |           |           |
|                                | Secondary/higher |           |           |           |           |           |           |           |           |
| Marital status                 | Single    |           |           |           |           |           |           |           |           |
|                                | Married    |           |           |           |           |           |           |           |           |
|                                | Widowed    |           |           |           |           |           |           |           |           |
| Drinks regularly               | No        |           |           |           |           |           |           |           |           |
|                                | Yes       |           |           |           |           |           |           |           |           |
| No. of sexual partners in lifetime | 1        |           |           |           |           |           |           |           |           |
|                                | 2         |           |           |           |           |           |           |           |           |
|                                | 3         |           |           |           |           |           |           |           |           |
|                                | 4+        |           |           |           |           |           |           |           |           |
| Condom use with non-regular partner | Never   |           |           |           |           |           |           |           |           |
|                                | Less than a year |           |           |           |           |           |           |           |           |
|                                | More than a year |           |           |           |           |           |           |           |           |

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Table 5. Comparison of HIV prevalence between religions over time, Manicaland, Zimbabwe: univariate and nested multivariate regression models for 1998–2000 and 2003–2005: females.

| Characteristic                      | Coding | 1998–2000 | 2003–2005 | 1998–2000 | 2003–2005 | 1998–2000 | 2003–2005 | 1998–2000 | 2003–2005 |
|-------------------------------------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                                     |        | HIV+ (%)  | OR p-value| HIV+ (%)  | OR p-value| HIV+ (%)  | OR p-value| HIV+ (%)  | OR p-value|
| Religion                            |        |           |           |           |           |           |           |           |           |
| Traditional                         |        | 35.4%     | 1.7 0.001 | 32.6%     | 1.4 0.093 | 32.6%     | 1.4 0.093 | 1.8 0.413 |
| Spiritual                           |        | 25.6%     | 1.1 0.357 | 21.6%     | 1.0 0.998 | 21.6%     | 1.0 0.998 | 1.5 0.057 |
| Other                               |        | 27.6%     | 1.2 0.166 | 21.0%     | 1.1 0.352 | 21.0%     | 1.1 0.352 | 1.1 0.920 |
| None                                |        | 37.5%     | 1.9 <0.001| 30.7%     | 1.5 0.009 | 30.7%     | 1.5 0.009 | 1.1 0.675 |
| Christian                           |        | 24.1%     | 1         | 18.3%     | 1         | 1         | 1         | 1         |
| Age-group                           |        |           |           |           |           |           |           |           |           |
| < 25 years                          |        | 15.8%     | 1.0       | 8.3%      | 1         | 8.3%      | 1         | 1         |
| 25–34 years                         |        | 40.5%     | 3.6 <0.001| 32.3%     | 2.2 <0.001| 32.3%     | 2.2 <0.001| 1.6 <0.001|
| > 35 years                          |        | 26.4%     | 1.9 <0.001| 28.4%     | 0.9 0.366 | 28.4%     | 0.9 0.366 | 0.7 0.005 |
| Education                           |        |           |           |           |           |           |           |           |           |
| None/primary                        |        | 29.2%     | 1.4 0.004 | 23.1%     | 1.2 0.021 | 23.1%     | 1.2 0.021 | 1.1 0.165 |
| Secondary/higher                    |        | 22.2%     | 1         | 17.5%     | 1         | 17.5%     | 1         | 1         |
| Marital status                      |        |           |           |           |           |           |           |           |           |
| Single                              |        | 9.0%      | 1         | 4.9%      | 1         | 4.9%      | 1         | 1         |
| Married                             |        | 23.4%     | 3.1 <0.001| 18.0%     | 2.3 <0.001| 18.0%     | 2.3 <0.001| 1.3 0.310 |
| Divorced                            |        | 49.9%     | 10.1 <0.001| 38.0%     | 7.3 <0.001| 38.0%     | 7.3 <0.001| 1.4 0.187 |
| Widowed                             |        | 22.7%     | 12.7 <0.001| 47.2%     | 10.8 <0.001| 47.2%     | 10.8 <0.001| 4.3 <0.001|
| Drinks regularly                    |        |           |           |           |           |           |           |           |           |
| No                                  |        | 25.1%     | 1         | 19.9%     | 1         | 19.9%     | 1         | 1         |
| Yes                                 |        | 72.2%     | 7.8 <0.001| 65.2%     | 1.6 0.199 | 65.2%     | 1.6 0.199 | 2.6 0.180 |
| No. of sexual partners in lifetime  |        |           |           |           |           |           |           |           |           |
| 2                                   |        | 21.7%     | 2.1 <0.001| 37.9%     | 1.9 <0.001| 37.9%     | 1.9 <0.001| 2.2 <0.001|
| 3                                   |        | 50.0%     | 3.6 <0.001| 44.9%     | 3.0 <0.001| 44.9%     | 3.0 <0.001| 1.6 0.140 |
| 4+                                  |        | 62.5%     | 6.0 <0.001| 63.1%     | 4.5 <0.001| 63.1%     | 4.5 <0.001| 5.0 <0.001|
| Condom use with non-regular partner |        |           |           |           |           |           |           |           |           |
| Never                               |        | 0.8       | 0.8 0.377 | 42.3%     | 0.8 0.377 | 42.3%     | 0.8 0.377 | 1.0 0.974 |
| Less than a year                    |        | 0.139     | 0.139     | 36.3%     | 0.139     | 36.3%     | 0.139     | 0.519     |
| More than a year                    |        | 37.2%     | 37.2%     | 37.2%     | 37.2%     | 37.2%     | 37.2%     | 1         |

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alcohol consumption – and reinforced through regular meetings – have been well attuned with national programme prevention messages. Therefore, it is quite plausible that members of Christian churches responded faster and more effectively in reducing their odds of HIV infection than those with no religion or in other major church groupings.

We observed extensive movements between churches. Overall, a larger fraction of Spiritualists than of Christian churches had joined their church recently (within the current study period). HIV prevalence was higher in new female converts than in long-term members – possibly, in part, due to ill-health as a reason for changing church – so these individuals could have contributed to the slower decline in HIV prevalence found in women in Spiritualist churches. However, unlike in the past, when Spiritual churches drew mainly from followers of Traditional religion [20], many of these new converts had joined from other Spiritualist churches so any such effect seems likely to be fairly small.

There have been surprisingly few previous detailed studies of associations between religious groupings and HIV risk in sub-Saharan Africa. In a study in Ghana, Takyi found that knowledge about HIV varied by religion but that there were no differences in sexual behaviour including condom use. [21] Similarly, in Malawi, Trinitapoli and colleagues found no differences in abstinence, faithfulness or condom use between members of Traditional, Christian, Muslim and non-religious groups, after adjusting for differences in gender, age, and education. [7] In Zimbabwe, a study examining the influence of religion on attitudes, behaviours, and HIV infection among rural adolescent women between the period of 2007–2010 also found that the initial protective effect exhibited by Apostolics changed over time. This change was attributed to early marriage and the prohibition of members seeking medical testing and treatment. [22]

The strengths of this study include a large general population sample, representing four of the main socio-economic strata in Zimbabwe, and the availability of longitudinal data spanning a period of HIV decline associated with reductions in sexual risk behaviour. An important limitation of the serial cross-sectional analysis is that inferences about the direction of causality cannot be made since it is impossible to distinguish whether a person’s religious affiliation preceded their HIV infection or behaviour. We examined differences between religious groupings in HIV prevalence and in changes in HIV prevalence over time. HIV prevalence is a useful indicator for assessing the relative burden of infection between time points and between different population groups. However, HIV prevalence is a measure of the cumulative rather than the recent risk of infection. Therefore, in assessing the contribution of differences in sexual behaviour to differences in HIV prevalence between groups and over time, we used a matching measure of cumulative behaviour (number of sexual partners in the lifetime). A comparison of changes in HIV incidence might have provided a clearer picture of the contributions of different religions to recent reductions in HIV risk. However, no data on HIV incidence were available in this study for the period prior to the reduction in HIV risk.

Social desirability bias and recall bias can distort self-reported data on sexual behaviour. In this study, we used a validated Informal Confidental Voting Interview method to reduce bias in reporting of sexual risk behaviours. [23] However, some residual bias may distort our comparisons of risk behaviour between religious groupings and over time. Importantly, despite these limitations, we did find that differences in HIV prevalence between religious groupings and over time could be explained by differences in sexual behaviour.

Participation rates were high overall, but the study suffered from selective exclusion of members of the African Apostolic Church of Johane Marange, who could have a different pattern of HIV risk to members of other major Spiritualist churches in eastern Zimbabwe. In a study in South Africa, Garner found that extra- and pre-marital sex was reduced in Pentecostal churches compared to other Christian churches due to high levels of indoctrination, religious experience, exclusion and socialisation. [8] Thus, HIV risk can vary amongst churches within the major religious groupings. In the current study, we found only small differences in HIV prevalence and associated behaviours between Roman Catholics and other Christians (results not shown).

Nonetheless, more research is required to describe and investigate differences within religious groupings, to establish whether further changes in patterns of HIV risk between religious groups have occurred since the mid-2000s as well as to provide a deeper understanding of the different obstacles to behaviour change that exist between and within religions and insight as to how these obstacles might be addressed.

This study provides valuable information on the contribution of religion as a determinant of responses to the HIV epidemic in Zimbabwe. The data suggest that Christian churches, in particular, may have played an important role in facilitating the reductions in HIV risk that occurred in the country in the late 1990s and early 2000s. [11] The current study period pre-dates the introduction of antiretroviral therapy (ART) in Zimbabwe. However, policy-makers in Zimbabwe will need to take into account the different health beliefs in Spiritualist churches and Traditionalists when engaging with leaders of these religions to promote uptake of new treatment and prevention services such as ART and medical male circumcision as also suggested in a study conducted in Mozambique. [24] The results presented here suggest that strengthened engagement with the leaders of these religions could also be used to identify means of overcoming cultural obstacles to further reductions in risk behaviour.

**Author Contributions**

Conceived and designed the experiments: RM CS SG. Analyzed the data: RM CS SG. Contributed reagents/materials/analysis tools: RM CS SG. Wrote the paper: RM CS SG.

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