

# Assessing the effect of an online HIV/AIDS course on 1st-year pharmacy students' knowledge

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**Background.** More international HIV/AIDS intervention initiatives targeting young adults are needed to help reach targets set by the Joint United Nations Programme on HIV and AIDS (UNAIDS).

**Objectives.** To determine the effect of an online HIV/AIDS course on 1st-year pharmacy students' knowledge of HIV prevention and transmission and of the science of HIV infection.

**Methods.** Online anonymous surveys, the Pre- and Post-Confirmation of Acceptance for Studies, were administered by means of an online survey tool, SurveyMonkey (USA), to 1st-year pharmacy students, from 2009 to 2013. These surveys were administered online during the first and last weeks of class, respectively.

**Results.** With regard to HIV prevention and transmission, student knowledge of the manner in which HIV is transmitted improved during the course. Overall, students were more confident about their knowledge of HIV prevention. They also indicated that as a direct result of taking the AIDS Online International course they were more reluctant to have unsafe sex and more confident about how to protect themselves against HIV/AIDS. Their scientific knowledge also improved.

**Conclusion.** The implementation of an online HIV/AIDS course has proved to be an effective method of HIV/AIDS education, and may also be a viable HIV intervention initiative.

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One of the targets of the Joint United Nations Programme on HIV and AIDS (UNAIDS) 2016 - 2021 plan is the following: '90% of young people are empowered with the skills, knowledge and capability to protect themselves from HIV'.<sup>[1]</sup> Therefore, the development of effective HIV prevention programmes is a top public health and policy priority.<sup>[2]</sup> However, in spite of calls to increase awareness of the high levels of HIV transmission in young women,<sup>[3]</sup> particularly in southern Africa,<sup>[4]</sup> there is little scientific consensus about how best to prevent HIV infection among the youth.

Comprehensive sexuality education is considered an important means of addressing adolescent risk behaviours,<sup>[5]</sup> although little evidence supports its direct effect on biological measures of prevention success, particularly of HIV and other sexually transmitted infections (STIs).<sup>[5]</sup> In sub-Saharan Africa, experience with youth HIV prevention programmes is limited, with evidence regarding effectiveness still emerging.

Prior reviews and studies of youth intervention programmes in both developed and developing countries<sup>[2,5,6]</sup> suggest an important role for education interventions to increase young people's knowledge of sexuality, reproductive health and HIV prevention, with a majority of interventions leading to reductions in reported risk behaviours. As young people are a target for knowledge and skills development, it is imperative that more HIV/AIDS prevention and education initiatives are developed that target the nation's youth. This research addressed the effect of an online HIV/AIDS course on student knowledge of HIV prevention and transmission and of the science of HIV infection.

In the second semester of 2009, the Discipline of Pharmaceutical Sciences, School of Health Sciences, University of KwaZulu-Natal, Durban, South Africa began to test the concept of online AIDS education by offering an online course on HIV/AIDS in collaboration with Dr Sharron Jenkins of Purdue University, Indiana, USA. The sensitivity of the topics related to HIV/AIDS, such as sexual preferences, practices and behaviours, could be

quite uncomfortable for students in the traditional classroom setting. In light of these observations, Purdue University began delivering an online-only course, providing students the opportunity to have candid, open, and anonymous dialogue about sex and HIV/AIDS. This approach was also adopted at the University of KwaZulu-Natal (UKZN).

The primary purpose of this article is to present and discuss the results of an anonymous online course, the Pre- and Post-Confirmation of Acceptance for Studies (Pre-CAS and Post-CAS, respectively), given to students during the first and last weeks of class, respectively. The surveys were designed to assess the overall effect of the AIDS Online International (AOI) course on HIV-related attitudes, beliefs, knowledge and risk behaviours. Only the effect on knowledge is presented in this article.

## Methods

The AOI course was offered as an 8-credit mandatory pharmacy module in the second semester of the first year at UKZN. The course was given over 17 weeks (including the examination week). Ninety-seven students took the course in the first year of its implementation. Thereafter, 101 students (2010), 98 students (2011), 113 students (2012) and 104 students (2013) took the course.

The AOI course runs online only through a course management system and consists of weekly quizzes, examinations, discussion board activities, animations, and videos/movies to support the learning objectives of the course. In addition, students participate in several online mock activities, including HIV testing, HIV risk assessment, and mandatory online discussions. Embedded into the online delivery of the course, the material and assessments are designed to reflect two theories: the Health Belief Model and Social Cognitive Theory – two well-established models that attempt to explain and predict health behaviours by focusing on the attitudes and beliefs of individuals, including exploring health behaviours associated with HIV transmission.

Over a 17-week period, students are given approximately 14 lessons, covering topics such as HIV/AIDS history/origin, statistics, transmission, prevention, testing, and the science of HIV disease progression/opportunistic infections, AIDS diagnosis, vaccines, and antiviral drugs. HIV prevention activities span 2 - 3 weeks. Halfway through the course students participate in a midsemester activity to help them to assess their personal risk of HIV infection. The activity is a 20-question survey of behaviours that may place the student and his/her partner at risk of contracting HIV. Students also watch one movie on AIDS history and several online animations related to testing HIV-positive and the science of infection. The online animations provide case studies that help students personalise their own risk of HIV infection. By participating in online mock activities, such as HIV testing and risk assessment, students are able to evaluate their sexual practices and their perceived susceptibility and vulnerability to HIV

infection. The activities also provide students with skills to practise and negotiate safer sex.

To assess the effect of the AOI course on participants, online anonymous surveys, the Pre-CAS and Post-CAS, were administered by means of an online survey tool, SurveyMonkey (USA). The surveys were used to assess the knowledge, attitudes, beliefs, and behavioural practices of course participants. The Pre-CAS was administered online during the first week of class and the Post-CAS during the last week of class. Approximately 100 questions were posed to students in each of the 5-year periods. Pre-CAS and Post-CAS statements discussed here cover four main categories: knowledge of HIV transmission/prevention, attitudes/beliefs regarding AIDS-related issues, science of HIV infection, and HIV risk behaviours. Each survey statement allowed students to respond by selecting one of the following: strongly agree, agree, not sure, disagree, strongly disagree, or skip the question. Paired

**Table 1. Demographics of students from 2009 to 2013, %**

Demographics	2009 (n=97)		2010 (n=101)		2011 (n=98)		2012 (n=113)		2013 (n=104)	
	Pre-CAS	Post-CAS	Pre-CAS	Post-CAS	Pre-CAS	Post-CAS	Pre-CAS	Post-CAS	Pre-CAS	Post-CAS
Gender										
Female	70.10	60.82	61.39	62.38	76.53	80.61	57.52	59.29	76.00	73.00
Male	29.90	25.77	26.73	26.73	13.27	15.31	21.24	23.89	24.00	27.00
Age categories, years										
15 - 19	80.41	69.07	76.24	74.26	81.63	84.69	55.75	61.95	77.00	76.00
20 - 24	19.59	17.53	9.90	12.87	5.10	8.16	20.35	19.47	24.00	22.00
Marital status										
Single	69.07	64.95	62.38	69.31	73.47	83.67	58.41	63.72	77.90	77.00
Single, but in monogamous relationship	27.84	17.53	22.77	16.83	13.27	9.18	17.70	18.58	19.20	22.00
Single with more than one sex partner	3.09	4.12	1.98	1.98	1.10	0.00	1.90	0.00	1.90	0.00
Married	0.00	0.00	1.10	1.10	2.30	3.20	0.00	1.00	1.00	1.00
Sexual preference										
Heterosexual male (sex with women only)	26.80	24.74	23.76	23.76	13.27	12.24	22.12	23.89	25.00	27.00
Homosexual male (sex with men only)	7.22	2.06	5.94	0.99	6.12	5.10	3.54	2.65	3.80	4.00
Bisexual male (sex with both men and women)	1.03	1.03	0.00	0.99	0.00	0.00	0.00	0.00	0.00	0.00
Heterosexual female (sex with men only)	58.76	57.73	56.44	62.38	68.37	72.45	51.33	54.87	68.30	67.00
Living arrangements										
Renting house/apartment	27.84	27.84	20.79	20.79	11.22	12.24	35.40	36.28	41.30	44.00
Own house/apartment	4.10	7.10	9.70	2.20	11.22	10.20	5.80	5.00	5.80	5.00
Staying with family/friends who rent house/apartment	12.40	3.60	5.40	14.30	17.35	12.24	8.70	8.00	8.70	8.00
Staying with family/friends who own house/apartment	53.61	48.45	50.50	51.49	45.92	58.16	28.32	32.74	41.30	41.00
Access to a regular doctor, nurse or health practitioner										
Yes	70.10	64.95	65.35	61.39	69.39	82.65	45.13	51.33	61.50	63.00

Table 2. Knowledge about HIV/AIDS (as a mean score) from 2009 to 2013, with p-values

Knowledge about HIV transmission/prevention	2009 (n=97)			2010 (n=101)			2011 (n=98)			2012 (n=113)			2013 (n=104)		
	Pre-CAS	Post-CAS	p-value	Pre-CAS	Post-CAS	p-value	Pre-CAS	Post-CAS	p-value	Pre-CAS	Post-CAS	p-value	Pre-CAS	Post-CAS	p-value
Do you agree or disagree with the following statements?															
I am confident that I know the correct and most effective way to use a condom	2.05	1.42	0.0029	2.02	1.30	0.0000	2.39	1.32	0.0000	2.44	1.53	0.0000	2.29	1.44	0.0106
I am reluctant to have unsafe sex because of what I've learned from this course	2.00	1.43	0.0010	1.87	1.40	0.0101	2.06	1.43	0.0005	2.15	1.51	0.0034	2.07	1.64	0.2604*
HIV tests generally test for HIV antibodies and not for the virus	2.04	1.08	0.0000	1.76	1.17	0.0000	1.71	1.21	0.0004	2.13	1.20	0.0000	3.06	3.46	0.0000
An HIV test during the 'window period' could result in a false-negative result	1.27	1.03	0.0049	1.28	1.14	0.1017*	1.31	1.14	0.0958*	1.39	1.04	0.0005	3.06	3.46	0.0008
I am aware of at least one HIV/AIDS support group in my area	1.62	1.24	0.0001	1.57	1.23	0.0020	1.73	1.50	0.1399*	1.68	1.44	0.0208	3.06	3.46	0.0505*
Is it possible to contract or transmit HIV through the following ways?															
Oral sex with an HIV-infected person	1.43	1.09	0.0025	1.40	1.08	0.0022	1.37	1.04	0.0000	1.34	1.11	0.0064	3.06	3.46	0.0304
Receiving breast milk from an HIV-infected mother (mother-to-child transmission)	1.16	1.05	0.0601*	1.27	1.06	0.0072	1.10	1.02	0.1344*	1.33	1.07	0.0008	3.06	3.46	0.0273
Deep kissing or 'French kissing' an HIV-infected person	1.89	1.38	0.0000	1.99	1.39	0.0000	2.00	1.26	0.0000	2.08	1.40	0.0000	3.06	3.46	0.0052
Which of the following groups of people would be at risk for contracting HIV? Choose all that apply															
Men who have sex with men (homosexual men)	1.53	1.00	0.0000	1.24	1.05	0.0086	1.41	1.02	0.0000	1.32	1.04	0.0008	3.06	3.46	0.0395

Continued ...

Table 2. (continued) Knowledge about HIV/AIDS (as a mean score) from 2009 to 2013, with p-values

Knowledge about HIV transmission/prevention	2009 (n=97)			2010 (n=101)			2011 (n=98)			2012 (n=113)			2013 (n=104)		
	Pre-CAS	Post-CAS	p-value	Pre-CAS	Post-CAS	p-value	Pre-CAS	Post-CAS	p-value	Pre-CAS	Post-CAS	p-value	Pre-CAS	Post-CAS	p-value
People who have had a sexually transmitted disease	1.44	1.01	0.0000	1.26	1.03	0.0027	1.18	1.03	0.0550	1.26	1.08	0.0234	3.06	3.46	0.0056
People who inject drugs	1.53	1.02	0.0000	1.19	1.06	0.0271	1.21	1.03	0.0069	1.17	1.07	0.3203*	3.06	3.46	0.0046
A person who French kisses a person with HIV infection	1.85	1.38	0.0000	1.93	1.38	0.0000	2.01	1.20	0.0000	1.98	1.38	0.0000	3.06	3.46	0.0003
Do you agree or disagree with the following statements?															
I know all the ways to prevent HIV transmission	1.87	1.19	0.0000	1.62	1.18	0.0005	1.65	1.10	0.0000	1.85	1.36	0.0005	3.06	3.46	0.0035
Globally, most people contract HIV through heterosexual contact	1.77	1.24	0.0000	1.80	1.14	0.0000	1.92	1.17	0.0000	1.60	1.24	0.0040	3.06	3.46	0.0149
Douching after sex can prevent HIV transmission	2.48	2.01	0.0000	2.44	2.03	0.0000	2.41	2.04	0.0000	2.30	2.06	0.0040	3.06	3.46	0.0001
<b>Knowledge of the science of HIV</b>															
Do you agree or disagree with the following statements?															
Some antiviral drugs can help prevent mother-to-child transmission of HIV	1.33	1.08	0.0134	1.47	1.08	0.0001	1.30	1.15	0.0424	1.35	1.12	0.0115	3.06	3.46	0.0095
A positive HIV test means that the body is producing antibodies to HIV	1.66	1.02	0.0000	1.64	1.03	0.0000	1.52	1.12	0.0000	1.66	1.11	0.0000	3.06	3.46	0.0000
A CD4 cell is an immune cell	1.38	1.01	0.0000	1.42	1.05	0.0005	1.44	1.04	0.0000	1.37	1.06	0.0007	3.06	3.46	0.0089
There are two main types of HIV, three main groups, and several subtypes	2.47	1.02	0.0000	2.35	1.05	0.0000	2.47	1.08	0.0000	2.23	1.11	0.0000	3.06	3.46	0.0000
Reverse transcription is a step in the HIV life cycle	1.44	1.00	0.0000	1.19	1.07	0.0963*	1.21	1.05	0.0030	1.45	1.11	0.0001	3.06	3.46	0.0079
Integrase, reverse transcriptase, and protease are HIV enzymes	1.87	1.01	0.0000	1.51	1.06	0.0001	1.60	1.03	0.0000	1.63	1.07	0.0000	3.06	3.46	0.0006
Antiviral drugs such as zidovudine (AZT) and didanosine (ddI) are reverse transcriptase inhibitors	2.05	1.16	0.0000	2.11	1.16	0.0000	2.21	1.24	0.0000	1.90	1.33	0.0000	3.06	3.46	0.0026

\* Non-significant p-values.

*t*-tests were calculated for each year to determine if there were significant differences between the Pre-CAS and Post-CAS statements.

Ethical clearance to administer and analyse the questionnaire was obtained from UKZN. Informed consent was obtained from the students, who were aware that they could volunteer for the survey and withdraw from it at any time. Anonymity was maintained and no identifying information on the student was obtained (except gender and age).

## Results

The data presented in Tables 1 and 2 are results of the Pre-CAS and Post-CAS surveys from 2009 to 2013. Table 1 presents the demographics of the students over the 5-year period. The majority of students were female and single. Most were in the 15 - 19-year age group and in most instances stayed with family or friends. Most students reported being heterosexual and had access to a regular doctor or nurse.

In terms of knowledge of HIV prevention and transmission, student knowledge on the methods of HIV transmission improved during the course (Table 2). For instance, correct identification of HIV transmission increased in the Post-CAS for oral sex, mother-to-child transmission during childbirth, and mother-to-child transmission via breastfeeding. Overall, students were more confident in their knowledge of HIV prevention. They also indicated that as a direct result of taking the AOI course they were more reluctant to have unsafe sex and more confident about how to protect themselves. Knowledge of the science of the disease and of medication therapy improved.

There were some differences in cohort responses over the 5-year period. Of concern is the 2013 cohort's response to the course in terms of 'I am reluctant to have unsafe sex because of what I've learned from this course' ( $p=0.2604$ ), which might indicate that risky behaviour was being practised. This group also seemed unsure if HIV could be transmitted via breastmilk. They had very different responses from the group of the previous year (in terms of mean scores). As this was an online anonymous survey, further investigation as to the reason for the difference could not be undertaken.

## Discussion

Although most students were reasonably knowledgeable about HIV transmission and prevention before the course, Pre-CAS and Post-CAS data indicate that they were more confident about their knowledge after the course. The AOI course did have a significant effect in helping students to understand the science of HIV disease. It is important, however, to continue to investigate if the 2013 cohort responses were an anomaly or if there are other reasons for youth to respond to the questions in such a manner. It could be that there are now too many messages being provided through different media, which creates confusion. This topic must be further researched.

Studies found that although students have reasonable knowledge about HIV prevention measures, they do not make behavioural changes because: (i) they lack the technical and/or communication skills to practise safe sex; (ii) they do not personalise the risk by separating themselves from the issue; and (iii) they do not socialise or have discussions about safe sex as there is a homosexual stigma associated with AIDS.<sup>[7,8]</sup> Therefore, to translate knowledge about HIV into risk-reducing behaviours, prevention initiatives must be able to personalise the risk of HIV infection, the seriousness of becoming infected, the benefits of practising safer sex, and the skills learned so that there is self-efficacy to practise them.<sup>[9]</sup> The AOI course is designed to reflect these theories by incorporating into the curriculum activities intended to influence specific beliefs towards safer sexual practices.

Recent studies indicate that computerised, online or internet-based HIV prevention initiatives may be a viable way to promote HIV education, awareness and prevention skills.<sup>[10,11]</sup> The results of this study suggest that an online course on AIDS may be a viable and effective way to influence students' knowledge related to HIV/AIDS and HIV risk behaviours. Furthermore, the AOI course proved to be an effective HIV prevention initiative with the potential to make a significant international contribution to HIV prevention initiatives – educating large numbers of young adults about preventing the spread of HIV.

This study had a higher proportion of female than male students, which could have affected the responses to the survey, and might be a limitation of this study. A Ghanaian study in 2012,<sup>[12]</sup> which had a more equitable distribution of male and female students, found that the female students had significantly ( $p=0.017$ ) more knowledge about HIV/AIDS than their male counterparts. The results were similar to those of studies conducted in Nigeria,<sup>[13,14]</sup> which found that AIDS knowledge differs on the basis of gender among university students.

## Conclusion

The online HIV/AIDS course provided a safe and anonymous environment for students to acquire the knowledge necessary to understand the science of the disease and knowledge on HIV prevention and transmission in terms of their own attitude and behaviour. It can be used across disciplines in the health sciences as a way to engage students in discussions on risky behaviours and provide them with information to protect themselves against infection, or on the management of the infection. Results from UKZN cohorts will need to be compared with cohorts at other universities across the globe that are teaching the AOI course, and to assess whether a class with more male students would alter these results. However, results suggest that this could be a good intervention for higher education.

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