ORIGINAL RESEARCH PAPER

Medical Science

RELIABILITY AND VALIDITY OF HIV SELF-REPORTED RESULT IN DETERMINING HIV PREVALENCE IN A REGION WITH HIGH HIV PREVALENCE: WESTERN KENYA

KEY WORDS: Western Kenya, HIV Self-reported result, Actual HIV result, agreement, Cohen's kappa, accurate measure of HIV status.

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ABSTRACT

Background: Several studies have been done around HIV self-reported result, there is still a paucity of data on the reliability and validity of data from self-reported HIV result. We sought to assess the reliability and validity of self-reported HIV result in western Kenya, a region with high HIV prevalence.

Methodology: We used a prospective cohort study design. Participants aged 15 years or older were recruited to the study using simple random technique. Eligible participants were taken through a behavioral interview and later followed up for HIV testing.

Results: A total 5955 respondents were interviewed and later tested for HIV within one year, and 99.9% reported having an HIV test. Agreement between self-reported and actual HIV result was 96.9% with a Cohen's kappa of 0.869(95%CI= 0.8501 - 0.8874). Males (kappa = 0.874, 95%CI 0.841 - 0.907) presented slightly higher agreement than women (kappa = 0.866, 95%CI 0.843 - 0.889). The sensitivity of HIV self-reported result was 0.81, 95%CI (0.784 -0.836) and a specificity of 0.997, 95%CI (0.995-0.998) with an accuracy of 0.97, 95%CI (0.965-0.974). HIV self-reported result had a higher positive predictive value of 0.978, 95%CI (0.964-0.987). Knowing partner's HIV status, testing previously as couples and being 45 – 49 years of age had significantly increased odds of correctly reporting HIV status.

Conclusion: Self-reported positive status provides an accurate measure of HIV status, hence self-reported sero-positivity should be treated as HIV positive for purposes of surveillance and equally for inclusion into interventions which require HIV positive individuals.

INTRODUCTION

Understanding risk perception is important for designing appropriate strategies for HIV/AIDS prevention, as they generally rely on behavior modification (King, 1999; Bignami-Van *et al.,* 2007). A key component of HIV risk perception is the individual's own assessment of being infected, and the extent to which this assessment is correct. Self-assessed HIV status is particularly relevant when access to HIV testing is limited (as in most developing countries) and the individual's behavior is guided more by perceived risk of infection than actual, but unknown, HIV status (Bignami-Van *et al.,* 2007). In these settings, it is thus especially important to examine the extent to which the reported HIV infection deviates from actual HIV status. However, this issue has been infrequently studied.

Most HIV Population based studies, rely on self-reported result to determine the HIV prevalence and the uptake of HIV testing services. Reliance on the self-reported HIV result has been of great controversy. Numerous studies have examined reliability and validity of HIV self-reported result among the high-risk population and have found reliable results (Darke, 1998; Dowling-Guyer *et al*., 1994; Fisher *et al*., 1999; Fisher *et al.,* 1993; Fisher *et al*., 2004; Goldstein *et al.,* 1995; Johnson *et al*., 2000; Kalichman *et al*., 2000; Rugg *et al*., 2000; Saltzman *et al.,* 1987; Sohler *et al*., 2000).

Few studies have assessed the reliability and or validity of HIV self-reported result in the general population and they have generated contrasting results. For example, a study of attendees at a voluntary HIV testing center in Zambia found a 30% rate of incorrect self-reports, with sero-positive patients being only slightly more accurate than sero-negative patients (72% v 60%) (Chintu *et al*., 1997). In contrast, a case-control study in Tanzania found no significant difference between perceived risk of infection and HIV status (Quigley *et al.*, 1997). In addition, a population-based study in Malawi found that only 39% of those whose tests were positive reported some likelihood of being infected (Bignami-Van *et al.*, 2007). While from KAIS 2007, 27.6% of HIV-infected persons reported not to be infected based on their last HIV test, and 16.4% 95% reported being infected based on the results of their last HIV test (KAIS, 2007).

To have confidence in the self-reported data, the reliability and validity of these self-reported data must be examined within different populations and contexts. In this paper, we examine reliability and validity of HIV self - reported results and explore in the general population with high HIV prevalence. We also investigated the various factors which predicts the validity and of HIV self - reported results.

MATERIAL AND METHODS

This was a prospective cohort study in which eligible participants were interviewed and later followed up for HIV testing. We conducted this study in KEMRI/CDC Gem health and demographic surveillance area (HDSA) which follows a population of approximately 83,059 individuals. GEM is one of the 6 sub counties in Siaya County which has the fourth highest HIV burden in Kenya estimated at 23%, more than 4 times the national HIV prevalence (Kenya HIV Estimates, 2014). A total of 10,512 participants aged 15 years and above were taken trough HIV behavioral survey and later followed up for HIV counselling and testing. We only considered 5955 participants who were interviewed and later tested within one year in the final analysis.

Measurements

Our outcome variable was measured as the concordance between HIV self-reported result and actual HIV result. The rapid HIV testing protocols followed Kenya's national guidelines (National ADIS Control Programme, 2008). Every participant 15 years of age or older undergoing testing had 0.5 mL of blood collected by a finger stick for rapid HIV antibody testing. Two test kits approved by the Kenyan Ministry of Health, Determine (Abbott Laboratories, Abbot Park, IL) and Bioline were used for each specimen and run in parallel. For discordant results, a third rapid test, Uni-gold (Trinity Biotech PLC, Bray, Ireland) was processed as a tiebreaker to determine the final result. For both children and adults, dried blood samples were taken on filter paper. ELISA was performed at the Kenya Medical Research Institute (KEMRI)/Centers for Disease Control and Prevention (CDC) laboratories on a 5% sample of dried blood samples for quality control. The ELISA result was communicated to the participant if discrepant from the rapid testing result. Our screening variable was self-report of HIV sero-status as measured by two questions: "Have you ever had an HIV test?" and "What was your most recent HIV test result?"

Procedures

Data collection was conducted at household level. Eligible participants were interviewed using interviewer-administered structured behavioral questionnaire and later followed up for HIV

testing. The questionnaires were translated to local dialects (*Dholuo* and Kiswahili) to enhance understanding during data collection and the responses were then back-translated to English. We offered counselling and testing to participants in line with the national testing algorithm. Written consent was obtained from eligible adult participants and parental permission and assent from the minors. Finger prick blood was drawn and results provided within less than 1 hour with counselling. Participants who tested positive were referred to the nearest HIV comprehensive care facility.

Statistical Analysis

We examined concordance between self-reported HIV infection and positive rapid test results using the kappa coefficient (Rue *et al*., 2000). We used standard epidemiological measures of validity (sensitivity, specificity, negative and positive predictive values) to assess the validity of self-reported HIV infection. Sensitivity was computed as the ratio of those who correctly identified themselves as being positive to all those who were positive on the test. Specificity was calculated as the ratio of those correctly identifying themselves as being HIV negative to all those who were negative on the test. The positive predictive values was determined by the ratio of true positive to the number of individuals reporting they were HIV positive while the negative predictive value were calculated as the ratio of those truly negative to those reporting they were HIV negative. Logistics regression was used to examine predictors of concordance between self-reported HIV status and rapid test result. *P*-values ≤0.05 were considered statistically significant.

Ethical Issues

The study was approved by Kenya Medical Research Institute Ethical Review Committee (SCC #1801).

RESULTS

A total of 5955 participants met the eligibility criteria and were included in the final analysis. The reported HIV positive were slightly less than the actual HIV sero-positive (12.2% and 14.7% respectively). A comparison of the reported HIV status and the actual HIV test result was done to gauge the concordance between the two results, the findings (Table 1) showed an overall agreement of 96.9% with a good Cohen's kappa, 0.869(CI = 0.8501 - 0.8874). There was a marginal variation in agreement between HIV self-reported and the actual HIV result between males and females with males presenting slightly higher agreement, 97.5% with a Cohen's kappa of 0.874(CI = 0.841 - 0.907) as compared to females, 96.6% with a Cohen's kappa of 0.866(0.843 - 0.889).

Table 1: The agreement between HIV Self-Reported Result and the actual test result by sex

	Self-Reported HIV Result	HIV Test Result		Agreement	Expected Agreement	Kappa*	95% CI
		Positive n(%)	Negative n(%)				
Overall	Positive	709 (11.91)	16 (0.21)	96.94	76.71	0.8688	0.850 - 0.887
	Negative	166 (2.74)	5064 (85.04)				
Males	Positive	213 (9.81)	5 (0.23)	97.51	80.31	0.8736	0.841 - 0.907
	Negative	49 (2.26)	1904 (87.80)				
Females	Positive	496 (13.11)	11 (0.29)	96.62	74.74	0.8660	0.843 - 0.889
	Negative	117 (3.09)	3160 (83.51)				

Specificity of HIV self-reporting was excellent, 99% (95% CI = 0.9953, 0.9984) and a high sensitivity of 81% (95% CI = 0.7843, 0.8363) with an accuracy of 97% (95% CI = 0.9647, 0.9737). Among those who self-reported positive, the probability of testing positive was 97.8% (95%CI = 96.4% - 98.7%) while for those who self-reported negative, the probability of testing negative was 96.8% (95% CI = 96.3%, 97.3%) with 3.2% false negative rate (table 2).

Table 2: Sensitivity, Specificity, accuracy, positive and negative predictive values of HIV self-reported result

	Rate	Asymptotic 95% CI
Sensitivity	0.81	0.784 to 0.836
Specificity	0.997	0.995 to 0.998
Accuracy	0.97	0.965 to 0.974
Positive Predictive Value	0.978	0.964 to 0.987
Negative Predictive Value	0.968	0.963 to 0.973

Figure 1 displays the Receiver Operating Characteristics (ROC) curve. From the curve, the points are closer to the ideal coordinate, the curve approaches the ideal point faster with a ROC area of 0.904(95% CI = 0.891 – 0.917) all giving an indication that HIV self-reported result is a good measure of HIV status.

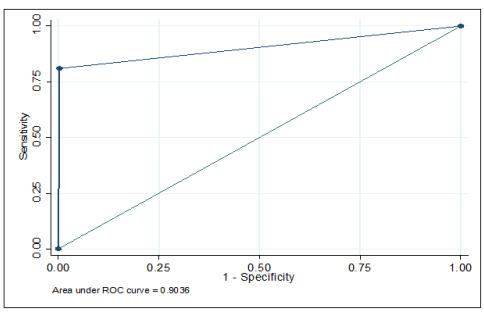

Figure 1: Receiver Operating Characteristics (ROC) curve of HIV Self-Reported Result

Logistic regression model controlling for other demographic characteristics indicated that the odds of incorrect self-reporting of HIV status among adolescent (15- 19 years) and single people who were HIV positive was high. In comparison with other age groups, people who were 25 – 29 years (OR 3.41 95%CI 1.326 – 8.742) and 45 – 49 years (OR 11.19 95%CI 3.641 - 34.413) were significantly more likely to correctly report their HIV positive status as compared to those who were less than 20 years of age. HIV positive married monogamous (OR 1.72, 95%CI 0.822 - 3.604), married polygamous (OR 1.72, 95%CI 0.692 - 4.293), divorced/separated (OR 2.66, 95%CI 0.717 - 9.884) and widowed (OR 2.04, 95%CI 0.843 - 4.923) had an increased odd of correctly reporting their HIV positive status compared to those who were single. Conversely, there was increased odds of misreporting HIV negative status among the divorced/separated (OR 0.06, 95%CI 0.003 - 0.920) and widowed (OR 0.09, 95%CI 0.008 - 0.895) (table 3).

Table 3: Socio-demographic factors associated with concordance between HIV self-reported result and the actual HIV result

	HIV Positive				HIV Negative			
	Correct HIV Self Reporting	Incorrect HIV Self Reporting	Adjusted		Correct HIV Self Reporting	Incorrect HIV Self Reporting	Adjusted	
Parameter	(n =709)	(n = 166)	OR (95% CI)	p – value	(n =5064)	(n =21)	OR (95% CI)	p - value
Sex								
Male	213(81.3)	49(18.7)	ref		1904(99.7)	5(0.3)	ref	
Female	496(80.9)	117(19.1)	1.08(0.696 - 1.670)	0.736	3160(99.7)	16(0.3)	1.12(0.350 - 3.585)	0.848

Age Group								
Less than 20 years	9(39.1)	14(60.9)	ref		754(100.0)	0(0.0)	-	
20 - 24 years	40(65.6)	21(34.4)	2.70(0.978 - 7.456)	0.055	630(99.8)	1(0.2)	-	
25 - 29 years	107(71.3)	43(28.7)	3.41(1.326 - 8.743)	0.011	514(99.8)	1(0.2)	-	
30 - 34 years	112(83.0)	23(17.0)	6.25(2.304 - 16.956)	<.0001	376(99.7)	1(0.3)	-	
35 - 39 years	115(92.0)	10(8.0)	14.70(4.850 - 44.522)	<.0001	345(99.7)	1(0.3)	-	
40 - 44 years	75(83.3)	15(16.7)	6.25(2.144 - 18.198)	<.0001	286(98.6)	4(1.4)	-	
45 - 49 years	89(89.9)	10(10.1)	11.19(3.641 - 34.413)	<.0001	285(97.9)	6(2.1)	-	
50 - 54 years	71(86.6)	11(13.4)	8.55(2.722 - 26.871)	<.0001	336(100.0)	0(0.0)	-	
55 - 59 years	47(87.0)	7(13.0)	8.84(2.566 - 30.425)	<.0001	316(100.0)	0(0.0)	-	
60 years and above	43(79.6)	11(20.4)	5.30(1.641 - 17.155)	0.005	924(99.8)	2(0.2)	-	
Marital Status								
Single	22(53.7)	19(46.3)	ref		1337(99.9)	1(0.1)	ref	
Married monogamous	393(80.4)	96(19.6)	1.72(0.822 - 3.604)	0.149	2474(99.7)	7(0.3)	0.24(0.029 - 2.027)	0.191
Married polygamous	82(82.2)	17(17.8)	1.72(0.692 - 4.293)	0.242	546(99.6)	2(0.4)	0.19(0.016 - 2.175)	0.181
Divorced or separated	20(83.3)	4(16.7)	2.66(0.717 - 9.884)	0.144	74(98.7)	1(1.3)	0.06(0.003 - 0.920)	0.043
Widowed	190(86.4)	30(13.6)	2.04(0.843 - 4.923)	0.114	625(99.2)	5(0.8)	0.09(0.008 - 0.895)	0.04
Highest level of education								
None	59(80.8)	14(19.2)	ref		632(99.4)	4(0.6)	ref	
Some Primary	528(80.4)	129(19.6)	1.36(0.687 - 2.699)	0.377	3573(99.8)	8(0.2)	1.64(0.449 - 6.004)	0.454
Some Secondary	110(83.3)	22(16.7)	1.44(0.641 - 3.250)	0.376	785(99.5)	4(0.5)	0.62(0.135 - 2.883)	0.546
Tertiary	12(92.3)	1(7.7)	2.89(0.327 - 25.454)	0.34	74(100.0)	0(0.0)	-	
p - value for likelihood ratio test of concordance adjusted for demographic characteristics								

In contrast to those who were tested less than 1 month after self-reporting their status, HIV positive individuals who were tested between 1-3 months (p<0.05) and more than 6 months (p<0.05) after the interview were more likely to correctly report their HIV. The HIV positive individuals who reported to have knowledge of the partner's HIV status were significantly more likely to report their status accurately (OR = 3.44, 95%CI 2.290 - 5.192, p<0.001). Testing as couples has significantly reduced risk of misreporting (OR = 0.47, 95%CI 0.271 - 0.817, p = 0.007) (table 4).

Table 4: Behavioral factors associated with concordance between HIV self-reported result and actual HIV result

	HIV Positive				**HIV Negative**			
	Correct HIV Self Reporting	Incorrect HIV Self Reporting	Adjusted		Correct HIV Self Reporting	Incorrect HIV Self Reporting	Adjusted	
Parameter	(n =709)	(n = 166)	OR (95% CI)	p - value	(n = 5064)	(n = 21)	OR (95% CI)	p - value
Time to testing after interview								
Less than 1 month	243(78.64)	66(21.36)	Ref		1968(99.90)	2(0.10)	Ref	
1 - 3 months	63(74.12)	22(25.88)	2.64(1.127 - 6.198)	0.025	470(99.58)	2(0.42)	0.66(0.040 - 10.917)	0.773
4 - 6 months	62(86.11)	10(13.89)	1.30(0.743 - 2.289)	0.335	256(99.61)	1(0.39)	2.26(0.202 - 25.346)	0.507
>6 months	341(83.37)	68(16.63)	1.84(1.056 -3.222)	0.031	2370(99.54)	11(0.46)	0.54(0.066 - 4.387)	0.562
Number of sex partners								
None	3(50.00)	3(50.00)	1.17(0.641 - 2.135)	0.608	732(100.00)	0(0.00)	-	
1 sex partner	25(75.76)	8(24.24)	0.59(0.202 - 1.351)	0.18	594(99.83)	1(0.17)	-	
2 partners	100(76.92)	30(23.08)	0.591(0.313 - 1.124)	0.109	867(99.77)	2(0.23)	-	
3 partners	132(77.19)	39(22.81)	0.66(0.358 - 1.208)	0.177	789(99.75)	2(0.25)	-	
4 partners	102(83.61)	20(16.39)	1.03(0.498 - 1.898)	0.93	434(99.77)	1(0.23)	-	
5 partners	57(82.61)	12(17.39)	0.99(0.445 - 2.183)	0.972	266(99.63)	1(0.37)	-	
> 5 partners	119(83.22)	24(16.78)	Ref		602(99.50)	3(0.50)	Ref	
Knowledge of partners HIV status								
Yes I know	378(86.70)	58(13.30)	3.44(2.290 - 5.192)	<.0001	2153(99.72)	6(0.28)	1.80(0.539 - 5.989)	0.34
I don't know	145(66.82)	72(33.18)	Ref		965(99.48)	5(0.52)	Ref	
Circumcised								
Yes	53(80.30)	13(19.70)	Ref		441(99.77)	1(0.23)	Ref	
No	160(81,63)	36(18.37)	1.37(0.695 - 2.715)	0.361	1463(99.73)	4(0.27)	-	
Pregnancy status								
Yes	29(78.38)	8(21.62)	Ref		192(100.00)	0(0.00)	Ref	
No	248(81.31)	57(18.69)	1.24(0.535 - 2.857)	0.619	1201(99.67)	4(0.33)	-	
Previously tested as couples								
Yes	319(84.62)	58(15.38)	0.47(0.271 - 0.817)	0.007	2193(99.73)	6(0.27)	4.04(0.510 - 32.045)	0.186
No	387(78.50)	106(21.50)	Ref		2826(99.65)	10(0.35)	Ref	
p - value for likelihood ratio test of concordance adjusted for behavioral factors								

DISCUSSION AND CONCLUSIONS

We found high misreporting among those who tested positive, particularly among the young (aged less than 20 years), single, had taken more than six months since they were last tested and those who do not know their partner's HIV status. The findings of the differences in self-reported negative is consistent with previous studies (McCusker *et al*., 1992; Dolcini *et al*., 2003; Fisher DG *et al*., 2007) who equally found a higher misreporting among HIV positive men who have sex with men. We also found significantly higher misreporting among those who were tested within 1 to 3 months and after 6 months of self-reporting HIV status. This could be due to HIV seroconversion or contacting the HIV virus after they had reported their HIV status. Our findings coincide with the findings of KAIS, 2007 where participants whose self-reports and actual HIV result were discordant were significantly more likely to have CD4 counts above 500 cells/μL than those who self-reported that they were infected, suggesting recent infection (Cherutich *et al.*, 2012; UNAIDS/WHO, 2007). The divorced/separated and widowed HIV negative persons were more likely to misreport their HIV status, this could be due to increased incidence of HIV

infection among these population. Several population based surveys have found high HIV prevalence among the widow and divorced/separated. Uganda Aids Indicator Survey, 2011 reported prevalence of 32.4% among the widowed which was 4 times the national prevalence and 17.8% among the divorced or separated which was equally twice compared to the married (7.2%). KAIS 2012, also reported high prevalence among the widowed and divorced or separated.

Our findings of high degree of concordance between self-report of prior HIV status and test result is consistent with findings in a study among men who have sex with men in Brazil (Mota, R.M.S. *et al.*, 2011) which found a high concordance between self-reported HIV status and test result with kappa of 88%. In Dalcini's 2013 study, discordant was only found among those who self-reported that they were uninfected. Although concordance was high, men had a relatively higher concordance rate than females. Our findings coincide with the findings of a population based survey conducted in Kenya (KAIS, 2007) in which HIV infected women 31.4% were significantly more likely than men 19.5% to self-report negative based on their previous test.

Relative to validity, this study found excellent specificity and relatively good sensitivity. Previous studies have reported high specificity and sensitivity as well. In a study among the drug users, a similar specificity of 98.8% and sensitivity of 81.8% was found (McCusker *et.al.*, 1992) and specificity of 99.5% and sensitivity of 93.1% for an Australian sample (McCusker *et al.*, 1993; Ross *et al.*, 1993). Fisher (2007) reported specificity of 94.8% but a lower sensitivity of 60.9%. The sensitivity reported by fisher was relatively lower than the findings of our study, the possible reasons could be because it was based on self-assessment and not necessarily on the previous HIV test. Thus, based on these findings coupled with the findings from prior studies it appears that a strong confidence may be placed on self-reported HIV status.

The predictive value of a test result is of interest to those deciding whether to use self-reported results in estimates of total sero-prevalence. Our findings suggest that the predictive values of both positive and negative self-report were high, with positive self-report somewhat more predictive than the negative self-report (98% vs 97%). Three different studies among MSM found a consistently higher positive predictive and negative predictive values: McCusker and colleagues in a study among the drug users found a positive predictive value of 90% and a negative predictive value of 98% (McCusker *et.al.*, 1992) while in a multicenter study in the United States, evaluating the accuracy of self-reports of HIV testing among men who have sex with men (MSM) 50 years old and older, showed that all men who had a positive results on screening tests self-reported as HIV positive and 99% of those with negative test result accurately self-reported themselves as negative (Dolcini *et al.*, 2003). However in a study conducted among men who have sex with men in Brazil found an excellent positive predictive value of 100% with a negative predictive value of 92.9% which was relative lower than the findings of other studies (Mota, R.M.S. *et al.*, 2011).

We explored the influence of behavioral factors on the accuracy of self-reporting of HIV status. Only knowledge of partner's HIV status and testing as couples previously were found to significantly predict correct self-reporting of HIV status. This could imply low HIV incidence rate among those who were tested as couples previously or those who had knowledge of partners HIV status. Previous studies conducted in urban Zambia ,and Rwanda to assess newly heterosexually transmitted infection among married and cohabiting couples reported low infection rate among those who had knowledge about partner's status (Tchendjou *et al.*, 2011). A study conducted among HIV- discordant couples equally found knowledge of partner's HIV status as an effective intervention of risk reduction (Matovu J.K., 2010).

There are several potential limitations to our findings. The results from our study were dominantly based on self-reported information, which is subject to reporting errors as well as recall bias. The type of data collection methods used in this case (personal interviews) may have contributed to such errors. For example, several studies have demonstrated that surveys conducted using personal interviews, computer assisted self-interviews (CASI) and audio computer assisted self-interview (audio-CASI) yield different estimates of levels of sensitive behaviors, although, which of these data collection approaches is most accurate remains to be determined(Turner *et al.*, 1998). Nevertheless, there is also evidence that self-reported sexual behavior data, though subject to reporting bias, can provide useful data that may help to design targeted intervention, as demonstrated by the often substantial and significant associations between reported risk and HIV infection studies from various African settings (Dare *et al.*, 1994). Another limitation was that our study was conducted in the context of a population which have been engaged in an ongoing public health research and surveillance. As such, the high number of those who had been previously tested might have not been representative of the general population. A third and final limitation is the lack of a time-limited recall period for testing. For example, self-reported uninfected individuals may have had a longer period since testing, making comparison difficult.

Our findings give further confidence on the reliability and validity of self-reported HIV result. However, caution need to be taken when using self-reporting to determine prevalence. Self-reporting result may need to be adjusted for demographic factors and other determinants like time lag since last test to yield accurate estimate.

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References

1. King, R. (1999). Sexual behavioural change for HIV: Where have theories taken us?
2. Bignami-Van Assche, S., Chao, L. W., Anglewicz, P., Chilongozi, D., & Bula, A. (2007). The validity of self-reported likelihood of HIV infection among the general population in rural Malawi. Sexually Transmitted Infections, 83(1), 35-40.
3. Chintu, C., Baboo, K. S., Gould, S. S., DuPont, H. L., & Murphy, J. R. (1997). False-positive self-reports of HIV infection. The Lancet, 349(9052), 650.
4. Quigley, M., Munguti, K., Grosskurth, H., Todd, J., Mosha, F., Senkoro, K. & Gavyole, A. (1997). Sexual behaviour patterns and other risk factors for HIV infection in rural Tanzania: a case–control study. Aids, 11(2), 237-248.
5. Bignami-Van Assche, S., Chao, L. W., Anglewicz, P., Chilongozi, D., & Bula, A. (2007). The validity of self-reported likelihood of HIV infection among the general population in rural Malawi. Sexually Transmitted Infections, 83(1), 35-40.
6. KAIS (2007). Kenya AIDS Indicator Survey. Preliminary Report, 2007 Nairobi, Kenya. M. o. Health. Nairobi.
7. Kenya HIV Estimates Report, 2014.
8. National AIDS and STI Control Programme MoPHaS, Kenya. Guidelines for HIV Testing and Counseling in Kenya. Nairobi, Kenya. 2008.
9. Rue, M., Valero, C., Quintana, S., Artigas, A., & Alvarez, M. (2000). Interobserver variability of the measurement of the mortality probability models (MPM II) in the assessment of severity of illness. Intensive care medicine, 26(3), 286-291.
10. McCusker, J., Stoddard, A. M., & McCarthy, E. (1992). The validity of self-reported HIV antibody test results. American journal of public health, 82(4), 567-569.
11. Dolcini, M. M., Catania, J. A., Stall, R. D., & Pollack, L. (2003). The HIV epidemic among older men who have sex with men. Journal of acquired immune deficiency syndromes (1999), 33, S115-21.
12. Cherutich, P., Bunnell, R., & Mermin, J. (2013). HIV testing: current practice and future directions. Current HIV/AIDS Reports, 10(2), 134-141.
13. UNAIDS/WHO (2007). "UNAIDS/WHO report highlights epidemic resurgence." AIDS Alert 22(1): suppl 1-3.
14. Mota, R. M. S., Kerr, L. R. F. S., Kendall, C., Pinho, A., de Mello, M. B., Dourado, I., ... & Benzaken, A. (2011). Reliability of self-report of HIV status among men who have sex with men in Brazil. JAIDS Journal of Acquired Immune Deficiency Syndromes, 57, S153-S156.
15. Ross MW, Loxley W, Wodak A, et al. Drug users' self-reported false-positive HIV status. Am J Public Health. 1993; 83:1349–1350.
16. Tchendjou, P. T., Koki, P. N., Eboko, F., Malateste, K., Essounga, A. N., Amassana, D. & Orne-Gliemann, J. (2011). Factors associated with history of HIV testing among pregnant women and their partners in Cameroon: baseline data from a Behavioral Intervention Trial (ANRS 12127 Prenahtest). JAIDS Journal of Acquired Immune Deficiency
17. Matovu, J. K. (2010). Preventing HIV transmission in married and cohabiting HIV-discordant couples in sub-Saharan Africa through combination prevention. Current HIV research, 8(6), 430-440.
18. Turner, C. F., Ku, L., Rogers, S. M., Lindberg, L. D., Pleck, J. H., & Sonenstein, F. L. (1998). Adolescent sexual behavior, drug use, and violence: increased reporting with computer survey technology. Science,280(5365), 867-873.
19. Dare, O. O., & Cleland, J. G. (1994). Reliability and validity of survey data on sexual behaviour. Health Transition Review, 93-110.