HIV Incidence among Adults with Multiple Sex Partners in Kisumu County, Western Kenya

#1123

John Owuoth[1,2], Valentine Sing'oei[1,2], Chiaka Nwoga[3,4], Adam Yates[3,4], June Otieno[2], Erica Broach[3,4], Qun Li[3,4], Zebiba Hassen[3,4], Michelle Imbach[3,4], Mark Milazzo[3,4], Tsedal Mebrahtu[3,4], Merlin L. Robb[4], Julie A. Ake[3,4], Christina S. Polyak[3,4], and Trevor A. Crowell[3,4] on behalf of the RV393 Study Group

[1]HJF Medical Research International, Kisumu, Kenya; [2]U.S. Military HIV Research Program, Walter Reed Army Institute of Research - Africa, Kisumu, Kenya; [3]U.S. Military HIV Research Program, CIDR, Walter Reed Army Institute of Research, Silver Spring, MD, USA; [4]The Henry M. Jackson Foundation for the Advancement of Military Medicine, Inc., Bethesda, MD, USA

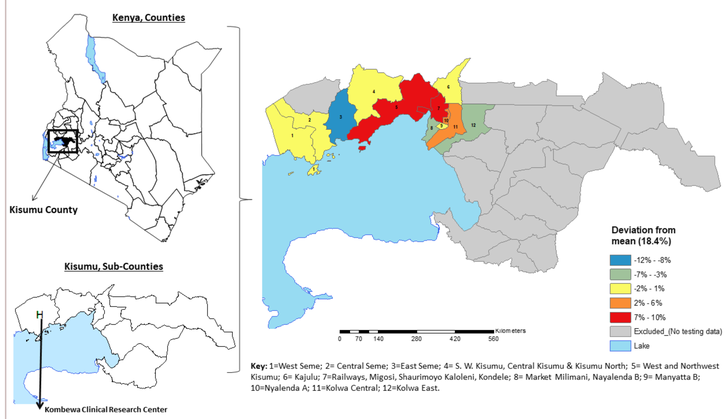
Background

Kenya has the fifth highest total number of persons living with HIV in the world with a prevalence of 4% among the adult population, which is a leading cause of adult morbidity and mortality in the region.

HIV prevalence in Kisumu County, Western Kenya, is more than four times the national average (**Figure 1**).

We estimated HIV incidence in a prospective cohort of adults with multiple sex partners in Kisumu County to identify HIV risk factors associated. and inform future clinical trials of HIV prevention interventions.

FIGURE 1. HIV prevalence deviation from the mean in Kisumu, Kenya



Key: 1=West Seme; 2= Central Seme; 3=East Seme; 4= S. W. Kisumu, Central Kisumu & Kisumu North; 5= West and Northwest Kisumu; 6= Kajulu; 7=Railways, Migosi, Shaurimoyo Kaloleni, Kondele; 8= Market Milimani, Nayalenda B; 9= Manyatta B; 10=Nyalenda A; 11=Kolwa Central; 12=Kolwa East.

Subregional deviation in HIV prevalence from overall point prevalence of 18.4% as in the RV393 study. Published in PLOS One (2024).

Methods

- We enrolled male and female participants aged 18-35 years from the at the Kombewa Clinical Research Centre in Kisumu, Kenya who reported sex with at least 2 partners in the preceding 3 months.
  - Visits occurred every 3 months for up to 24 months.
  - Every visit included medical history, physical exams, and HIV counseling and testing.
  - Every 6 months, visits included staff-administered questionnaires that collected socio-demographic, general health, and sexual activity information.
- Bivariate Cox proportional hazard models were used to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) for factors potentially associated with HIV acquisition over time.
  - Variables that were significant in the unadjusted bivariate model (p-value ≤0.05) were included in the adjusted multivariate model.
- Incidence rate was calculated for both the total cohort as well as disaggregated by study year.
  - Due to a clinical pause from the SARS-COV-2 pandemic, some participants had extended person-time (past 2 years) as their final visit was delayed.

Results

- Between January 2017 and August 2021, 619 participants without HIV were enrolled (**Table 1**)

TABLE 1: Sociodemographic and behavioral characteristics at Enrollment, by HIV status

Parameter	TOTAL (N= 619)	No (n= 608)	Yes (n=11)	P-value
Sex, Female	278(44.9)	270 (44.4)	8 (72.7)	0.0613
Age, Median (IQR) Years	21(21-28)			
Marital Status, Single or Widowed	408(65.9)	403 (66.3)	5 (45.5)	0.1486
Education, Some Secondary or More	284(45.9)	281 (46.2)	3 (27.3)	0.2114
Monthly Income (in Kenyan shillings), ≤9,000 KSH	313(50.8)	308 (50.9)	5 (45.5)	0.7199
Number of partners in the last 3 months, 4+ partners	88(14.3)	84 (13.9)	4 (36.4)	0.0354
Partner Type: Single-Night Encounter	84 (13.7)	81(13.4)	3(27.3)	0.1856
Forced to engage in unwanted sexual events	10(1.6)	9 (1.5)	1 (9.1)	0.0485
Exchanged sex for goods or money	226(40.1)	220 (39.8)	6 (54.5)	0.3225

Demographic and other characteristics ascertained at enrollment were examined for differences between participants who did and did not acquire HIV using Pearson's Chi-square tests or, in cases with small cell sizes, Fisher's exact test. All data are presented as n (%). Statistically significant p-values (p ≤0.05) are in bold.

- A total of 11 incident HIV cases occurred over 1117.9 person-years (incidence rate 9.84 per 1000 person-years [95%CI 5.22-17.03]) (**Table 2**).
  - Of the 11 participants who acquired HIV, 4 (36.4%) reported four or more sexual partners, 4 (66.7%) reported to have never used condom during sex with their primary sexual partner, and 6 (54.5%) reported exchanging sex for money, goods, gifts, or favors.
  - None reported a prior history of STI diagnosis or treatment.

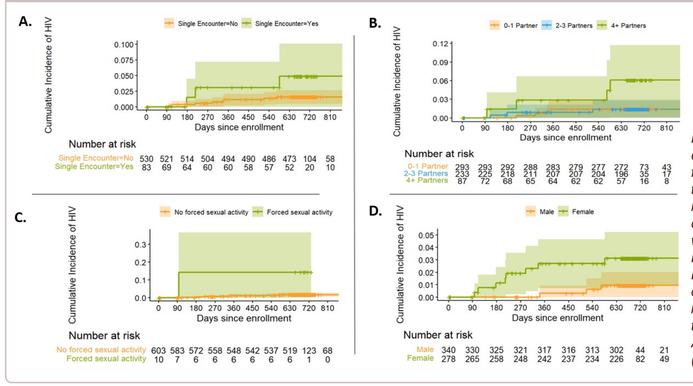
TABLE 2: Incidence Rates of HIV Acquisition by Study Year

	No. Converters	No. Non-seroconverters	Incidence Rate (per 1000 person-years)	95%CI
Total	11	608	9.84	5.22-17.03
Year 1	8	611	13.84	6.53-26.11
Year 2	3	555	5.59	1.55-14.91

Person-time was calculated as time between enrollment (in days) and the midpoint between the last visit with a negative HIV test and the visit with a positive HIV test. Incidence rate confidence limits were calculated using Byer's method to account for the relatively low case count.

- Unadjusted analyses identified several factors potentially associated with incident HIV (**Table 3; Figure 2**):
  - 4+ sexual partners (HR: 4.39, 95%CI: 1.10-17.55, as compared to 0-1 partner)
  - Female sex (HR: 3.44, 95%CI: 0.91-12.98)
  - Forced participation in sexual activity (HR: 9.15, 95%CI:1.17-71.51)
- In the multivariable logistic regression analysis, no participant characteristics showed statistically significant associations with incident HIV

TABLE 2: Incidence Rates of HIV Acquisition by Study Year



Kaplan-Meier survival curves were constructed for variables with p≤0.1 in the unadjusted bivariate regression models. Four covariates were examined with Kaplan-Meier curves: Partner type-Single Night Encounter (A), Number of Sexual Partners in the last 3 months (B), Forced to Participate in Sexual Activity (C), and Gender (D).

Factors such as female sex, 4+ sexual partners, and forced participation in sexual activity were associated with HIV acquisition.

TABLE 3: Unadjusted and Adjusted Cox Proportional Hazard Models of Factors Potentially Associated with Incident HIV Infection

Parameter	Category	Unadjusted Relative Risk (95%CI)	P-value	Adjusted Relative Risk (95% CI)	P-value
Sex	Male	Reference		Reference	
	Female	3.44 (0.91-12.98)	0.0679	2.97 (0.76-11.53)	0.1162
Age (years)	18 to 20	Reference		Reference	
	21 to 24	0.50 (0.07-3.52)	0.4829	---	
	25 to 29	0.94 (0.16-5.62)	0.9446		
	Age>=30	1.99 (0.36-10.85)	0.4280	---	
Marital Status	Married (Monogamous or Polygamous)	Reference		Reference	
	Separated or Divorced	2.11 (0.43-10.44)	0.3611	---	
	Single or Widowed	0.59 (0.14-2.45)	0.4645	---	
Education Level	Completed Primary or Less	Reference		Reference	
	Some Secondary or More	0.44 (0.12-1.64)	0.2207	---	
Monthly Income	≤9000 Kenyan Shillings	Reference		Reference	
	>9000 Kenyan Shillings	1.21 (0.37-3.95)	0.7581	---	
Number of Sexual Partners Last 3 Months	0 to 1 Partner	Reference		Reference	
	2-3 partners	1.01 (0.23-4.50)	0.9923	1.15 (0.25-5.24)	0.8564
	4+ partners	4.39 (1.10-17.55)	0.0365	3.44 (0.84-14.15)	0.0869
Sexual Partner type: Single-Night Encounter	No	Reference		Reference	
	Yes	3.08 (0.82-11.62)	0.0965	---	
Forced to Participate in Sexual Activity	No	Reference		Reference	
	Yes	9.15 (1.17-71.51)	0.0348	6.16 (0.76-49.95)	0.0886
Exchanged Sex for Goods or Money	No	Reference		Reference	
	Yes	2.02 (0.62-6.63)	0.2450	---	

Statistically significant p-values (P≤0.05) are indicated in bold text. Gender was forced selected into the multivariate model.

Conclusion

- We observed unexpectedly low HIV incidence among sexually active adults in Kisumu, which could be a result of effective HIV prevention programs or possibly the impact of COVID-related behavioral changes.
- Marginally higher HIV incidence among women may suggest gaps in access and uptake of risk reduction strategies.
- Diminished HIV risk during the later follow-up period may suggest a beneficial cohort effect from routine engagement and education.
- These results may inform future efforts to engage people who are vulnerable to HIV but not actively receiving HIV prevention interventions.

Acknowledgements: The authors are also thankful to the RV393 study participants who made this work possible. Institutions that supported this work included KEMRI, USMRD-A, HJF, HJF-MRI, MHRP, WRAIR/ WRAIR-Africa, and the Kenya Ministry of Health.

RV393 PI: John Owuoth, MBChB (john.owuoth@usamru-k.org)

Material has been reviewed by the Walter Reed Army Institute of Research. There is no objection to its presentation and/or publication. The opinions or assertions contained herein are the private views of the author, and are not to be construed as official, or as reflecting true views of the Department of the Army or the Department of Defense. The investigators have adhered to the policies for protection of human participants as prescribed in AR 70–25. This work was supported by cooperative agreements (W81XWH-11-2-0174; W81XWH-18-2-0040) between the Henry M. Jackson Foundation for the Advancement of Military Medicine, Inc., and the U.S. Department of Defense. This research was funded, in part, by the U.S. National Institute of Allergy and Infectious Diseases.