Epidemiologic and behavioral characterization of knowledge of condom use and modeling among military personnel

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ABSTRACT

How accurately condoms are being used vary across populations and knowledge of the factors determining its proper use remains unclear. Knowledge of such differentials and determinants would aid in evaluating the contributions of condom use to HIV epidemic reduction. Baseline data from the Situationally Focused Individual HIV/AIDS intervention to promote HIV protective behavior among 2,213 Nigerian Military Personnel were analyzed. Educational status as a predictor variable was assessed using univariable and multivariable logistic regression model. Compared to those with less than high school education, those with high school and some college education were two times more likely to demonstrate knowledge of condom use and modeling, prevalence odds ratio (POR), 2.32, 95% Confidence Interval (CI)=1.60-3.37. After adjustment for the relevant covariates, higher education attainment was associated with non-significant 62% increase in knowledge and modeling, POR, 1.62, 95% CI=0.78-3.38. This study is indicative of low knowledge of condom use and modeling among the Nigerian military personnel; as well as a direct correlation between education attainment and knowledge of condom use and modeling. (*Afr J Reprod Health* 2008; 12[2]:32-44)

RÉSUMÉ

La caractérisation épidemiologique et comportementale de la connaissance de l'usage du préservatif et du modelage chez le personnel militaire. La façon efficace dont l' on utilise les préservatifs varie à travers les populations et la connaissance des facteurs qui déterminant son bon usage n'est pas claire. Une connaissance des tels différentiels et déterminants aiderait à évaluer des contributions du bon usage des préservatifs en vue de la réduction de l'épidémie du VIH. Les données initiales de base qui ont été obtenues à partir de l'intervention du VIH/SID par rapport à l'individu sur qui on a concentré de manière situationnelle afin de promouvoir le comportement protecteur du VIH chez 2,213 personnel militaire nigérian ont été analysées. A l'aide de la cote composite des six démarches pour la connaissance de l'usage du préservatif et le modelage comme le variable de conséquence, nous avons examiné le niveau d'éducation comme un variable de l' indice, le modelage avec un univariable non-conditionnel et la régressive logistique multivariable. Quand on compare ceux qui n'ont pas eu l'éducation secondaire à ceux qui l'ont eu, les derniers avaient deux fois plus la possibilité de démontrer la connaissancede l'usage du préservatif et du modelage; le rapport de prévalence, 2,2,95% l'interval de Confiance IC= 1,60 – 3,37. Pourtant, l'association qui a été significative statistiquement n'a pas persisté après l'ajustement pour les co-variables; la prévalence du rapport, 1,62,95%IC=0,78 – 3,38. Cette étude montre une faible connaissance de l'usage du préservatif et du modelage parmi le personnel militaire nigérian; elle montre aussi l'influence des autres caractérisques en ce qui concerne le rôle de l'acquis de l'éducation dans la connaissance de l'usage du préservatif et du modelage. (*Rev Afr Santé Reprod* 2008; 12[2]:32-44)

KEY WORDS: *HIV/AIDS; Condom modeling; Knowledge of condom use; Epidemiology of condom modeling; education level*

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Introduction

Nigeria is the second most affected nation in sub-Saharan Africa (SSA) with HIV, representing 14% of HIV/AIDS cases in this region.[1] While the first HIV case was reported in Nigeria in 1986, the HIV infection prevalence continued to increase, from 1.8% in 1991 to 4.5% in 1996, 5.8% in 2001, but decreased to 5.0% in 2003.[2] This prevalence varies across occupation and state boundaries with previous studies of 2300 subjects from five states in Nigeria demonstrating a prevalence of over 60% among commercial sex workers (CSW), 8% among male clients of CSW, 9% among truck drivers , and 21% among patients with STI.[3] Among the Nigerian military personnel, (NMP), HIV prevalence has been reported to be higher than that of the general population,[4] due to the working condition of this special population.[5,6,7-9]

Previous and current data support the role of latex condom in HIV infection prevention, assuming its consistent,[10-17] and appropriate use. The knowledge of appropriate use and modeling of condom prior to intromission remains an effective approach to HIV epidemic reduction. Whereas studies have shown a direct correlation between higher education and consistent condom use,[18-21] protection against pregnancy and STDs,[22] and declining condom use and multiple sexual partners,[23] there are no studies, to our knowledge, that have examined the knowledge of appropriate steps in condom use and modeling as an outcome variable.

Behavioral and epidemiologic variables leading to consistent and appropriate condom use remain to be fully explored, especially among the NMP who are particularly at risk for HIV infection because of the transitional nature of their work. In this present study, we hypothesized that higher education attainment increased knowledge of the steps involved in accurate use of condom and modeling. To test this hypothesis, we examined the relationship between education attainment and knowledge of condom use and modeling as well as other potential determinants of the outcome variable, using unconditional logistic regression model.

MATERIALS AND METHODS

Human Subjects and Ethical Consideration

Relevant Institutional Review Boards (IRB) in the United States and Nigeria approved the research protocol; all participants provided informed consent.

STUDY PARTICIPANTS

Study participants were Nigerian military personnel. The study population consisted of a cohort of 2,213 men and women, between ages 18 to 55, recruited in 2003 for HIV education intervention. Of the 2,213, 13.3% were women and 86.7% were men, 43.9% had less than High School education and 56.1% had High School and some College education. The detail of the materials and methods is available elsewhere.[5, 6]

STUDY DESIGN

A cross-sectional design was utilized to assess the association between knowledge and modeling of how to correctly use a condom and educational status as well as

other potential predictors of this outcome variable. Two cantonments stationed in the Lagos area, the largest city in Africa, were selected for intervention. Data were collected between June and December 2003.

A modified version of a Center for AIDS Intervention Research at the University of Wisconsin, Medical College (Department of Psychiatry and Behavioral Medicine) Pridefest Survey was used. This instrument obtains information on socio-demographics (sex, age group, ethnic background, education level as highest level of education attainment, HIV status, gender of sexual partners, whether respondents had main sexual partner), sexual activities (sex with main or casual partners, frequency of vaginal, oral or anal sex with or without condom), drug use (alcohol, marijuana, amphetamines, ecstasy, cocaine, heroin), beliefs about condom, measured on a score of 1-10 scale with 1=100% disagree and 10=100% agree, and the steps in appropriate use of a condom.

VARIABLES MEASURE

Outcome/Response variable

The outcome variable in this study was knowledge and modeling of the steps involved in appropriate use of a condom. This measure comprised six steps: 1.) examination of condom package for expiration date, 2.) opening the condom package carefully, avoiding unintended tear and rupture, 3.) making sure it is the right side out, 4.) placing the condom at the head of the penis, 5.) squeezing air out prior to commencement of intromission or penile-oral sex, and 6.) rolling the condom down the penis. These steps were examined independently as a binary scale, with a score of one or zero. For example, the question on the examination of condom package for expiration date required the participants to choose this between the first and sixth step in appropriate use of a condom. With step one as the right response; this was coded 1 and all other responses were recoded as zero (0), making this a binary scale for the purpose of computation of the number of participants who obtained correct score on this step. A similar approach was used for steps two through six. Next, we grouped the response and obtained correct scores on any of the six steps and all the six steps combined. This response variable represents two measures: 1.) participants' ability to know and model any of the six steps correctly and, 2.) participants' ability to know and model all six steps correctly.

Predictor/Independent variables

Education attainment

The primary predictor or independent variable for this study was education attainment. This variable was measured on a categorical scale subdivided into four classes: (1) Elementary, (2) Junior secondary, (3) Senior secondary and (4) Some college. To present the findings in a way that could be easily interpretable by researchers across geographic boundaries, the United States education category was used for the equivalence of educational attainment, and generated two comparable categories: (1) Less than High School and (2) Equal to and greater than High School. Less than High School is comparable to elementary and junior secondary category, while equal to and greater than High School is comparable to senior secondary and some college education.

Other Covariates

The other independent variables as potential predictors of condom use and modeling were age, gender, casual sex practice, alcohol and marijuana use, and attitude towards condom acquisition. Categorical scale was used to measure age, HIV status, alcohol and marijuana use, while binary scale was used to measure gender and casual sex practice. Alcohol and marijuana use were measured as the frequency of use of these substances during the past six weeks.

STATISTICAL ANALYSIS

Chi square statistic with Fisher Exact test (correcting for small cells count) was used to test for independence with respect to education attainment and the covariates. Using unconditional univariable logistic regression model, we examined separately the relationship between each step in condom modeling a well as the combination of the steps, in the correct use of a condom and the covariates. Next, we performed multivariable analysis using unconditional logistic regression model to simultaneously adjust for the possible confounding effects of these variables on the effect of educational status on correct knowledge and modeling of condom use. We determined *a priori* that the independent variables in the multivariable logistic models would be those significantly associated with or biologically relevant to knowledge of condom use and modeling in the univariable analyses, using a statistically significance level, $P < 0.25$.[24] The final model building included only variables that were statistically significant at $P < 0.25$ or biologically relevant. The Hosmer-Lemeshow criteria [24] was used to perform the goodness of fit test. Further, statistical interaction was examined for age and sex, age and education, as well as age and gender at significance level, $P < 0.10$.[24] All statistical analyses were two-tailed, at *0.05* significance level and were performed using STATA statistical package, version 9.2.

Results

Table 1 presents study characteristics and other factors stratified by educational attainment. There were 2,213 participants, male n =1,918 (86.7%) and female = 295 (13.3%). The majority of the participants had either High school or some college education, n=1,240 (56.1%). There was a statistically significant difference in age group with respect to educational status, p <0.001. Male and female did not differ significantly by education status, $p > 0.05$.

Table 2 presents the correct and incorrect steps in condom modeling. There are six steps in the modeling process, with the first two steps namely checking condom for expiration dates and opening condom carefully associated with best knowledge and modeling, n=1,585 (80.6%) and n=1,495 (74.9%) respectively. The third and fifth steps in modeling, making sure condom is right side and squeezing air out of the condom prior to intromission or penile-oral sex were associated with the worst modeling outcomes, n=500 (25.5%) and n=539 (27.6%) respectively.

Table 3 presents the Univariable uncondi-tional logistic regression model of the association between educational attainment and steps in the correct use of condom. Compared to those with less than high school education, those with high school

Table 1. **Study characteristics and other factors by education attainment of Military Personnel**

Study characteristics	< High school Number (n)	Percentage (%)	> High School Number (n)	Percentage (%)	X^2 (df)	P value
Age group (yrs)					68.1(2)	<0.001
18-30	581	44.7	636	52.3		
31-49	327	35.9	584	64.1		
> 50	64	77.1	19	22.9		
Sex				0.1(1)	0.74	
Female	127	43.0	168	57.0		
Male	845	44.1	1.072	55.9		
Sex With HIV Positives					0.16(1)	0.69
No 679	41.8	945	58.2			
Yes 11	45.8	13	54.2			
Sexual activities during last 6 wks					0.05(1)	0.98
Yes 491	45.2	594	54.8			
No 448	45.2	543	54.8			
Sex With Main sexual partner					6.0(1)	0.01
No 481	41.3	684	58.7			
Yes 480	46.5	553	53.5			
Casual Sex					0.01(1)	0.99
No 485	44.0	618	56.0			
Yes 480	44.0	611	56.0			
Vaginal Sex					72.5(3)	<0.001
None	92	68.7	42	31.3		
1-5 Times	96	61.9	59	38.1		
6-10 Times	285	48.6	301	51.4		
>10 Times	457	38.4	734	61.3		
Anal Sex					5.7(2)	0.06*
None	254	27.2	680	72.8		
1-5 times	2	10.0	18	90.0		
6-10 times	1	100	0	0.0		
Alcohol Use					1.8(2)	0.40
None	419	44.0	533	56.0		
1-4 times	436	44.0	577	57.0		
>4 times	114	44.9	124	52.1		
Marijuana Use					34.2(2)	<0.01
None	693	41.1	991	58.9		
1-4 times	246	56.3	191	43.7		
>4 times	30	36.6	52	63.4		

Note: *Fisher's Exact

and some college education were two times more likely to model appropriately step one of condom use process, prevalence odds ratio (POR) = 2.15, 95% Confidence Interval (CI) = 1.71-2.71. Likewise there was a statistically significant 50% increased knowledge of condom use and modeling of step two among those with higher school or some college education compared with those with less than high school education, POR=1.50, 95% CI= 1.27-1.84. Also participants with higher school or some

Table 2. **The distribution of correct versus incorrect condom modeling among military personnel**

Steps in condom modeling	Number (n)	Percentage (%)
Step1: Check condom for expiration date (CCED)		
Correct modeling	1,585	80.6
Incorrect modeling	381	19.4
Step 2: Open condom very carefully (OCC)		
Correct modeling	1,495	74.9
Incorrect modeling	502	25.1
Step 3: Make sure it is right side out (RSO)		
Correct modeling	500	25.4
Incorrect modeling	1,465	74.6
Step 4: Place condom at head of penis (PCHP)		
Correct modeling	1088	54.5
Incorrect modeling	908	45.5
Step 5: Squeeze air out prior to intromission (SAC)		
Correct modeling	539	27.6
Incorrect modeling	1416	72.4
Step 6: Roll condom down the penis (RCP)		
Correct modeling	1359	68.0
Incorrect modeling	639	32.0

Note: 74 (3.4%) of all participants obtained accurate score on all six step, 130 (6.7%) of participants missed all the steps, whereas 1819 (93.3%) of the participants obtained at least one correct score on the steps.

Table 3. **Univariable unconditional logistic regression model of the association between educational attainment and steps in the correct knowledge of condom use and modeling**

Steps in the use of condom	Prevalence odds ratio	95% CI
Check condom for expiration (CCED)		
< High School	1.0 (reference)	reference
>High School	2.15	1.71-2.71
Open condom carefully (OCC)		
< High School	1.0 (reference)	reference
>High School	1.50	1.27-1.84
Right Side Out (RSO)		
< High School	1.0 (reference)	reference
>High School	1.11	0.91-1.37
Place Condom Penis Head (PCHP)		
< High School	1.0 (reference)	reference
>High School	1.36	1.14-1.62
Squeeze Air Out (SAC)		
< High School	1.0 (reference)	reference
>High School	1.41	1.16 – 1.73
Roll Condom Down Penis (RCP)		
< High School	1.0 (reference)	reference
>High School	1.83	1.51 – 2.21

Table 4. **Univariable unconditional logistic regression model for the association between education attainment and condom use knowledge and modeling among military personnel**

Covariate	Adjusted prevalence odds ratio (APOR)	95% CI
Education attainment		
<HS	1.0 (reference)	reference
>HS	**2.32**	**1.60-3.37**
Age Group(yrs)		
18-29	1.0 (reference)	reference
30-49	2.63	1.72-4.00
> 50	2.10	0.65-6.82
Sex		
Female	1.0 (reference)	reference
Male	0.99	0.55-1.81
Sex with main sexual partner		
No	1.0 (reference)	reference
Yes	0.66	0.46-0.96
Casual sex		
No	1.0 (reference)	reference
Yes	0.69	0.48-0.99
Vaginal sex		
None	1.0 (reference)	reference
1-4 times	2.14	1.17-3.89
5-10 times	6.08	3.58-10.32
> 10 times	10.36	6.25-17.16
Anal sex		
None	1.0 (reference)	reference
1-4 times	0.15	0.05- 0.48
Sex with HIV positives		
No	1.0 (reference)	reference
Yes	4.12	1.63-10.40
Sexual activities during last 6 wks		
Yes	1.0 (reference)	reference
No	0.70	0.49-1.01
Alcohol use		
None	1.0 (reference)	reference
1-4 times	0.41	0.27- 0.64
> 4 times	0.46	0.28-2.35
Marijuana use		
None	1.0 (reference)	reference
1-4 times	0.78	0.52-1.18
> 4 times	1.79	0.55-5.78

Notes: Vaginal and anal sex frequency during the past six weeks.

college were more likely to have knowledge of condom use and modeling with respect to steps three through six, $p < 0.05$.

Table 4 presents the composite score on condom use knowledge and modeling on a univariable logistic regression model. In this

unadjusted model of the composite score of either of the steps in condom modeling, education attainment was statistically significantly associated with knowledge of condom use and modeling. Compared to those with less than high school education, those with high school and some college education were two times more likely to demonstrate correct knowledge of condom use and modeling, POR=2.32, 95% CI=1.60-3.37. Compared with the lowest age category, the intermediate age group was two times more likely to demonstrate knowledge of condom use and modeling, POR=2.63, 95% CI= 1.75-4.0. Having sex with one main sexual partner was associated with a statistically significant 34% decrease in knowledge of condom use and modeling, POR=0.66, 95% CI=0.46-0.96. Likewise, engagement in casual sex was associated with a statistically significant 31% reduction in knowledge of condom use and modeling, POR=0.69, 95% CI=0.48- 0.99. The frequency of vaginal sexual intercourse was

Table 5. **Multivariable unconditional logistic regression model for the association between education attainment and condom use knowledge and modeling among military personnel**

Covariate	Adjusted prevalence odds ratio (APOR)	95% CI
Education attainment		
<HS	1.0 (reference)	reference
> HS	**1.62**	**0.78-3.38**
Age group (yrs)		
18-29	1.0 (reference)	reference
30-49	1.45	0.66-3.18
>50	1.12	0.13-9.94
Sex		
Female	1.0 (reference)	reference
Male	0.46	0.06-3.46
Sex with main sexual partner		
No	1.0 (reference)	reference
Yes	1.03	0.24-4.32
Casual sex		
No	1.0 (reference)	reference
Yes	1.02	0.24-4.22
Vaginal sex		
None	1.0 (reference)	reference
1-4 times	0.99	0.06-15.10
5-10 times	1.19	0.10-13.86
> 10 times	1.70	0.15-19.71
Anal sex		
Yes	1.0 (reference)	reference
No	0.26	0.05-1.25
Sex with HIV positives		
No	1.0 (reference)	reference
Yes	2.09	0.14-30.60
Alcohol use		
None	1.0 (reference)	reference
1-4 times	1.03	0.46-2.31
> 4 times	0.82	0.28-2.35

associated with a dose-response knowledge of condom use and modeling. Compared with no vaginal sex, participants who reported 1-4 times vaginal sex during the past six weeks were two times more likely to have knowledge of condom use and modeling, POR=2.14, 95% CI=1.17-3.89, 5-10 times, POR=6.10, 95% CI=3.60-10.32, > 10 times, POR=10.36, 95% CI=6.25-17-16. Anal sex was associated with a statistically significant decrease in knowledge of condom use and modeling. Compared with those who reported no involvement in anal sex, those who reported 1-4 times, were 85% less likely to exhibit knowledge of condom use and modeling, POR=0.15, 95% CI=0.05-0.48. Not having sex with HIV sero-positive individuals was associated with a statistically significant 4 times increase in knowledge of condom use and modeling, POR=4.12, 95% CI=1.63-10.40. There was a statistically significant decrease in knowledge of condom use and modeling by the frequency of alcohol use. Compared with participants who reported no alcohol use during the past six weeks, those who reported 1 to 4 times and more than 4 times were 59% and 54% less likely to illustrate knowledge of condom use and modeling, POR=0.41, 95% CI=0.27-0.64 and POR=0.46, 95% CI=0.25-0.84 respectively. In contrast, there was no statistically significant association between gender, sexual intercourse during the past six weeks, and marijuana use, and knowledge of condom use and modeling, $p > 0.05$.

Table 5 presents the prevalence odds ratio for the association between educational status and knowledge of condom use and modeling, controlling for age, gender, sexual intercourse with main sexual partner, casual sex, frequency of vaginal sex and anal sex, sex with HIV sero-positive individuals and frequency of alcohol use. The statistically significant association between educational status and knowledge of condom use and modeling observed in the unadjusted unconditional logistic regression model did not persist after controlling for these covariates, adjusted prevalence odds ratio, APOR=1.62, 95% CI=0.78-3.38. Likewise, though not shown on table, there was no statistically significant association between education status and knowledge of condom use after controlling for these covariates using a composite score of all correct steps in condom knowledge and modeling, APOR=2.58, 95% CI=0.31-21.60. Further, not having sex with HIV sero-positive individuals and having sex with main sexual partner were associated with 98% and 93% decreased knowledge of condom use and modeling among those with high school and some college education in the composite score of all correct steps, APOR=0.02, 95% CI=0.0004-0.86 and APOR=0.70, 95% CI=0.006-0.79 respectively.

Discussion

There are several relevant findings in this study on the association between knowledge of condom use and modeling and education status among military personnel. First, there is a low prevalence (3.4%) of correct knowledge of all six steps of condom use and modeling. Second, in the unadjusted logistic regression model, higher education level was statistically significantly associated with increased knowledge of condom use and modeling among participants with high school and some college education with respect to all steps in modeling except

making sure condom is right side out. Third, in the univariable (unadjusted) logistic regression model, higher education was statistically significantly associated with higher knowledge of condom use and modeling in the composite score involving correct knowledge of any of the steps in the modeling process. Fourth, after adjustment for covariates associated independently with knowledge of condom use and modeling, the statistically significant association between this outcome variable and educational status did not persist.

In this study, we have demonstrated that among NMP, the prevalence of knowledge on how to use condom and modeling is low, suggestive of the potential failure of condom to protect against STDs including HIV infection. Whereas there are a few studies relating education status to condom use and modeling, our finding supports a previous study that reported poor knowledge of condom use in a civilian population.[25]

Next, we found a statistically significant crude (unadjusted) correlation between higher education and knowledge of how to properly use condom with respect to all steps except making sure condom is right side out. Whereas, to our knowledge no study specifically examined knowledge of condom use and modeling in the military population, this result supports previous studies on a direct correlation between increased knowledge of condom use and higher educational status.[18-21] In addition, regardless of educational attainment, the prevalence of knowledge and modeling of how to check condom for expiration date and how to open condom carefully was high among NMP. The high prevalence of these two initial steps of condom modeling in this cohort is plausible, given the volume of information in the general public regarding these steps and the simplicity in achieving the steps.[10, 26,27]

We also found a statistically significant association between knowledge of condom use and modeling and educational status in a univariable logistic regression model using composite score on any appropriate step in condom modeling. A similar result was obtained with the frequency of vaginal sex, frequency of alcohol use, age, casual sex, sex with main sexual partner, and anal sex, but not with the frequency of marijuana use, and gender. Our finding of a direct correlation between higher educational status and knowledge of condom use and modeling supports previous findings in this dimension.[18-21] The associations we found with socio-demographic covariates and other factors related to education are indicative of the potential confounding effects of alcohol use, vaginal and anal sexual behavior, casual sex engagement, and sex with main sexual partner on the relationship between educational status and knowledge of condom use and modeling. It is therefore conceivable that studies examining the impact of education on the knowledge of condom use and modeling should attempt to control for factors that may serve as confounders in order to minimize their effects on the point estimate. The demonstration of decreased knowledge of condom use and modeling among those having sex with main sexual partner in this study implicitly supports a study that associated decline in condom use with multiple sex partners.[23] Another interesting finding on the effects of other covariates on condom use and modeling is a direct dose-response correlation between knowledge of

condom use and modeling and the frequency of vaginal sex. The dose-response in vaginal sex with the outcome variable is suggestive of the possibility of increasing skill in condom modeling given consistent vaginal sexual involvement, probably with multiple sexual partners.

There are some limitations in this study. First, generalizability of our findings is questionable since we focused on the military population. Second, as in all epidemiologic studies our finding may be influenced by unmeasured and residual confounding, since no amount of statistical modeling can completely remove confounding. Third, we used self-reported measures for covariates associated with the outcome variable and educational status. The accuracy of self reported measures of sexual behavior may vary as the function of the population and the behavior.[10] Nevertheless, self reported behaviors are accurate reflection of participants' action, given high reliability of properly assessed self-report in relation to sexual behavior.[26] Fourth, because we used composite score for the outcome variable, it is likely that this might have introduced misclassification bias into our point estimate on the effect of educational status on knowledge of condom use and modeling among NMP. However, it is unlikely that such misclassification is differential.

In summary, we have shown that among military personnel, there is no statistically significant relationship between educational status and knowledge of condom use and modeling. In addition, we have demonstrated that the prevalence of knowledge of condom use and modeling is relatively low in this cohort. Since accurate knowledge of condom use and modeling enhances HIV infection protection, this study is indicative of the need to incorporate condom use education and modeling in any HIV intervention prevention in this population and in similar populations at risk for HIV infection. Therefore, while further studies on the correlation between knowledge of condom use and modeling are needed (to address the influence of past behavior, norm, attitude, perceived control and intentions to use condom), our results suggest condom use education and modeling across at risks populations regardless of educational status or knowledge of HIV risk factors, in order to reduce HIV infections that are preventable through appropriate use of condoms.

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