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# The co-occurrence of correct and incorrect HIV transmission knowledge and perceived risk for HIV among women of childbearing age in El Salvador

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## Abstract

This article examines the co-occurrence of correct and incorrect knowledge about documented and undocumented modes of HIV transmission among women of childbearing age in El Salvador, and the relationship between HIV transmission knowledge and perceived risk. Incorrect beliefs about HIV transmission co-occur at high levels with, and are largely independent of, accurate knowledge about documented modes of transmission. The co-occurrence of correct and incorrect HIV transmission knowledge was shown to have important implications for perceived risk. Both correct and incorrect HIV transmission knowledge increased the odds of risk perception; uncertainty about risk was decreased among those with higher levels of correct knowledge and increased among those with higher levels of incorrect knowledge. Among those who considered themselves to be at some risk for HIV, higher levels of correct knowledge reduced uncertainty about the degree of risk, while higher levels of incorrect knowledge increased the degree of risk perceived. High levels of endorsement of the documented modes of HIV transmission do not necessarily indicate accurate or adequate knowledge about HIV transmission in the population. Co-occurring inaccurate beliefs about undocumented modes of transmission reflect cultural understandings of contagion and disease, and influence how individuals make sense of medical-scientific information about transmission. Our results suggest that the co-occurrence of correct and incorrect HIV transmission knowledge shapes individual-level risk perceptions. Given the independence of accurate knowledge and inaccurate beliefs, HIV/AIDS education and prevention programs must seek to directly undermine inaccurate beliefs about HIV transmission as part of their efforts to promote behavior change. © 2000 Elsevier Science Ltd. All rights reserved.

*Keywords:* HIV/AIDS; HIV transmission knowledge; Perceived risk; El Salvador

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## Introduction

Increasing knowledge about the ways that HIV is transmitted is a primary goal of educational campaigns aimed at promoting accurate HIV risk assessment and risk-reducing behavioral changes. In numerous countries, knowledge, attitudes, behaviors, and prac-

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tices (KABP)-style surveys have been used to assess levels of knowledge about HIV transmission in the general population, as well as to collect information on risk perceptions and behaviors. Similarly, these types of surveys have been used with non-representative samples from specific subgroups selected because of their epidemiological importance (Cleland & Ferry, 1995; Lane, 1993; Peruga & Celentano, 1993). The measurement of HIV transmission knowledge has varied across these studies; however, such surveys generally include a set of items that measure documented modes of HIV transmission, such as unprotected sexual intercourse, blood transfusion, and breast-feeding by an infected woman. Most surveys also include a variety of items that reference undocumented modes of transmission, such as shaking hands or transmission by mosquitoes.

A persistent finding of these KABP surveys is that many respondents simultaneously endorse both documented and undocumented modes of HIV transmission (Ingham, 1995; LeBlanc, 1993; London, VanLandingham & Grandjean, 1997). To date, this co-occurrence phenomenon and its implications have not been closely studied (for an exception, see VanLandingham et al., 1995; VanLandingham, Grandjean, Suprasert & Sittitrai, 1997). Moreover, the potential implications of misunderstandings about HIV transmission for risk perception and behavior have not been adequately addressed in HIV prevention campaigns. In a report from the World Health Organization on the KABP surveys that have been conducted in developing countries, Ingham (1995) warned that misinformation about the modes of HIV transmission required immediate attention (see also VanLandingham et al., 1997). Ingham (1995, p. 44) cautioned that the inability to properly discriminate between potential routes of transmission could “engender a feeling of helplessness such that no changes are made.” Additionally, he argued that inaccurate beliefs could foster fear and discrimination, which could further stigmatize people with HIV/AIDS and make prevention interventions more difficult.

We believe that comprehensive assessments of HIV transmission knowledge must distinguish and take into account accurate and inaccurate endorsements of documented and undocumented transmission routes respectively. Exclusive reliance on evidence that a high percentage of the population endorses the documented modes of transmission is inadequate to assess HIV transmission knowledge, and may lead to erroneous conclusions regarding the need for additional interventions. Evidence of high levels of belief in undocumented modes of HIV transmission in populations with high levels of accurate knowledge of the documented modes of HIV transmission suggests that folkways and culturally-specific beliefs about contagion and disease

(Douglas, 1966) filter and transform understandings of medical-scientific information about transmission (Maticka-Tyndale, 1992; VanLandingham et al., 1997; LeBlanc & Wardlaw, 1999). In such populations, high levels of accurate knowledge of the documented modes of transmission do not necessarily indicate accurate knowledge about HIV transmission. Moreover, the inability to distinguish between documented and undocumented modes of transmission might have important implications for risk perceptions, behaviors, and the design and implementation of HIV/AIDS prevention interventions.

In this paper, we examine the co-occurrence of accurate and inaccurate knowledge of documented and undocumented modes of HIV transmission among women of childbearing age in El Salvador. Data come from a nationally representative fertility and health study conducted in 1993 (Asociación Demográfica Salvadoreña and Centers for Disease Control and Prevention, 1994). We chose this data set for further analysis because previously published reports indicated that a large percentage of respondents endorsed numerous undocumented modes of HIV transmission despite the fact that almost all of the women accurately endorsed the documented modes of HIV transmission.

In El Salvador, the number of reported AIDS cases has increased rapidly in recent years, and the epidemiology of HIV/AIDS has changed (UNAIDS, 1998). Officially-reported AIDS cases, considered to represent only a fraction of the total in the population, increased from one case in 1985 to 460 in 1997. Before 1994, 10% of cases were women, and in 45% of all cases, infection was reported to have occurred through heterosexual sex. In 1996, 25% of cases were women, and infection was reported to have occurred through heterosexual sex in 85% of all cases. The increasing importance of heterosexual transmission in El Salvador is consistent with shifting epidemiological patterns throughout Central America (Mann, Tarantola & Netter, 1992). Overall, the total number of people aged 15–49 years living with HIV in El Salvador is estimated to be 18,000; women represent 24% of this population (UNAIDS, 1998).

Data from demographic and health surveys provide some indication of the context in which women in El Salvador become sexually active and thereby become exposed to the risk of acquiring a sexually transmitted infections (Asociación Demográfica Salvadoreña and Centers for Disease Control and Prevention, 1994). Among women in El Salvador, age at first intercourse is estimated to be 16.4 years for women not in a union and 16.7 years for women in a union. Only 4.4% of women reported that they used any type of contraception at first intercourse. Many women in El Salvador lack basic knowledge about reproductive health; when asked about when in the menstrual cycle a woman is

most likely to get pregnant, only 10% of 15–24 year old women were able to give a correct answer. Even among women with more than 10 years of education, only 17.5% were able to answer correctly.

Informal unions rather than formal marriages predominate in El Salvador. In recent fertility surveys, approximately 56% of women reported that they were living in a union at the time of the survey. However, only 23% of these women were living in formal marriages. Among younger women (15–19 years), virtually all of those who were not single lived in informal unions. The percentage of women in a formal marriage increased rapidly with age, but it was only after age 30 that a higher percentage of women in unions of any kind were married instead of in an informal union (Dirección General de Estadística y Censos, 1995).

As in many other developing countries, in El Salvador, educational attainment for women lags behind that of men. Among the population age 15 years and older, 31% of women are illiterate, compared to 27% of men (Proyecto Estado de la Región, 1999). Among women 15–34 years of age, the percentage of illiterate women is considerably higher in rural areas than in urban areas. Approximately 30% of rural women aged 15–34 years reported themselves to be illiterate, compared to 8% of same-age women in urban areas. Changes in women's access to education over the past few decades are reflected in different rates of illiteracy among younger women (13% among those 15–19 years old) and older women (24% among those 30–34 years old).

In the analyses that follow, overall HIV transmission knowledge is indicated by correct knowledge of the documented routes of HIV transmission and correct rejection of undocumented modes of transmission. Inaccurate HIV transmission knowledge is indicated by a failure to know documented modes of transmission and by belief in undocumented modes of HIV transmission. In the majority of our analyses, we distinguish "correct" HIV transmission knowledge (accurate endorsement of documented modes of transmission) and "incorrect" HIV transmission knowledge (endorsement of undocumented modes of HIV transmission). Previously published studies indicate that inaccurate knowledge in El Salvador is manifested most commonly as belief in undocumented modes of transmission (Asociación Demográfica Salvadoreña and Centers for Disease Control and Prevention, 1994). Among women of childbearing age in El Salvador, 90% or more of the respondents endorsed each documented mode of HIV transmission; however, undocumented modes of transmission were simultaneously endorsed by 13–89% of respondents.

In the first section of the paper, we examine the occurrence of correct and incorrect HIV transmission knowledge among women of childbearing ages. We

expected that older women, women with higher educational attainment and socioeconomic standing, women with more sexual experience, women living in the capital city, and women who had more contact with reproductive health services would have higher levels of total and "correct" HIV transmission knowledge, and less "incorrect" knowledge. In the second part of the paper, we examine risk perception in relation to correct and incorrect HIV transmission knowledge. We do this by estimating a two-part model. In the first part, we examine correlates of any risk perception (including uncertainty about risk), and in the second part, we examine degree of risk among those who perceive themselves to be at some risk (including uncertainty about degree of risk). In each stage, we expected that, net of other factors, correct knowledge would decrease perceptions of risk and uncertainty about risk, while incorrect knowledge would increase perceived risk and uncertainty.

## Data and methods

### Data

In this paper we use data from the 1993 National Family Health Survey of El Salvador (Asociación Demográfica Salvadoreña and Centers for Disease Control, 1994), a representative sample of women aged 15–49 years. Sample selection was carried out in three stages. In the first stage, census sectors were selected with probabilities proportional to the number of households in the sector. In each sector selected in the first stage, 40 households were selected at random. In the final stage, eligible women were interviewed; if there was more than one eligible woman in the household, one was selected randomly. A total of 9000 dwellings were visited between March and July of 1993. Of those, 73% had an eligible respondent; completed interviews were obtained for 94.7% of sampled women. The total number of completed interviews was 6207.

The survey collected information on characteristics of women and their households, pregnancy history, use of maternal and child health services, use of family planning, children's immunization schedules, children's anthropometry, maternal mortality and morbidity of siblings, and knowledge about and perceptions of risk for HIV/AIDS. In-person interviews were conducted in Spanish in women's homes.

### Dependent variables

The survey included a series of questions on knowledge about the transmission of HIV/AIDS and perceptions of risk. The transmission knowledge items

referred to documented and undocumented modes of transmission respectively, such that it was possible to construct “correct” and “incorrect” transmission knowledge scales and evaluate the extent to which they appear to reference the same underlying construct.

A total of 12 documented and undocumented modes of transmission were assessed (Table 1). These included: kissing on the forehead; kissing on the mouth; donating blood; blood transfusion; shaking hands with someone; sexual relations between men; sexual relations between a man and a woman; being bitten by a mosquito; injection with used needles or syringes; sharing razor blades; childbirth when the woman has HIV/AIDS; and breast-feeding when the woman has HIV/AIDS. These items were intermixed in a battery that began with the following statement: “Do you believe that AIDS is transmitted by (READ THE ALTERNATIVES).” Responses were coded as “yes”, “no”, and “don’t know”/no answer.

We began by constructing a total knowledge scale using all of the items. For this scale, a value of one was assigned for accurate endorsement of a documented mode of transmission and accurate rejection of an undocumented mode of transmission. Don’t know and no answer responses were treated as inaccurate and classified accordingly for each item. We divided the total number of items correct by 12 and multiplied by 100, such that the total knowledge scale ranges theoretically from 0 to 100 and reflects the percent of the transmission knowledge items answered correctly. Chronbach’s alpha for the total knowledge scale was

0.64. While minimally acceptable, this alpha coefficient is relatively low for a scale comprised of 12 items, which suggests that the items may not reference the same underlying construct (Zimet, 1992).

We then decomposed the total knowledge scale into correct/documented and incorrect/undocumented transmission knowledge scales. For this, we utilized the same classifications of documented and undocumented modes of transmission that have been used in previous reports (Asociación Demográfica Salvadoreña and Centers for Disease Control, 1994). We assessed correct/documented transmission knowledge as the proportion of the six documented modes of transmission that the respondent endorsed as modes of transmission (multiplied by 100). We assessed incorrect/undocumented transmission knowledge in the same manner, except with reference to the undocumented modes of transmission. Thus, each scale ranges theoretically from 0 to 100, with higher scores on the “correct” knowledge scale reflecting better understanding of documented modes of transmission and higher scores on the “incorrect” knowledge scale reflecting more erroneous beliefs about transmission (i.e. more endorsement of undocumented modes of transmission). Chronbach’s alpha for the correct and incorrect knowledge scale respectively was 0.79 and 0.65.

The survey also asked respondents to report the extent to which they perceived themselves to be at risk for HIV/AIDS. Respondents were first asked if they believed that they were at risk for getting HIV/AIDS; response options were “yes,” “no,” and “don’t know.”

Table 1

Endorsement of documented and undocumented modes of HIV transmission, 1993 El Salvador National Family Health Survey<sup>a</sup>

Modes of transmission <sup>b</sup>	% that answered yes
Kissing on the forehead	15.2
Kissing on the mouth	41.9
Donating blood	89.5
Blood transfusion	90.9
Shaking hands with someone	13.4
Sexual relations between men	94.9
Sexual relations between a man and a woman	95.9
Being bitten by a mosquito	55.1
Injections with used or non disposable needles or syringes	92.7
Sharing razor blades	79.4
Childbirth when the mother has AIDS	92.4
Breast-feeding when the mother has AIDS	89.2
Number of Women	6121

<sup>a</sup> Source: Asociación Demográfica Salvadoreña and Centers for Disease Control (1994).

<sup>b</sup> The exact wording of the series on the questionnaire is: ¿Cree Ud. que el SIDA se contagia (LEA LAS ALTERNATIVAS): al besar la frente; al besar la boca; al donar o dar sangre; cuando le ponen sangre (transfusión); al dar la mano a una persona; al tener relaciones sexuales los hombres; al tener relaciones sexuales entre un hombre y una mujer; al ser picado por un zancudo; al ser inyectado con agujas o jeringas no descartables o ya usadas; al usar hojas de afeitar/Gillette; al nacer los niños de una madre con SIDA; al darle pecho a su niño una madre con SIDA?.

Those who indicated that they were at some risk for HIV/AIDS were then asked whether they thought they were at a little or a lot of risk; respondents could also report that they were uncertain of how much risk they were at. Thus, we analyzed perceived risk in two stages. We used a multinomial logistic regression model to estimate the influence of correct and incorrect knowledge on a three-category dependent variable (not at risk, at risk, and uncertain about risk). In the second stage, we used multinomial logistic regression to examine correlates of degree of risk (low, high, don't know) among those who reported themselves to be at some risk.

### Independent variables

We examined selected sociodemographic variables as potential correlates of total, correct, and incorrect HIV transmission knowledge, and perceived risk. Table 2 presents selected characteristics for our analytic sample. Age and education were measured continuously in years. Socioeconomic status was measured with a continuous variable constructed as a count of

Table 2  
Selected sample characteristics of persons who had heard of HIV/AIDS, 1993 El Salvador National Family Health Survey<sup>a</sup>

Variables	Mean	%
<i>Continuous variables:</i>		
Age	28.9	
Education <sup>b</sup>	5.7	
Index of socioeconomic status <sup>c,d</sup>	12.1	
<i>Categorical variables:</i>		
Currently in union		54.8
Place of residence		
Capital city		30.9
Other urban area		29.7
Rural area		39.4
Ever sexually active		75.7
Ever used contraceptives		49.6
Ever had Pap smear		51.1

<sup>a</sup> Source: Asociación Demográfica Salvadoreña and Centers for Disease Control (1994).

<sup>b</sup> SD = 4.5; observed range 15–49.

<sup>c</sup> SD = 10.7; observed range 0–44.9.

<sup>d</sup> The goods and services that were assessed, and their prevalences, are: masonry or adobe walls (82.7%); concrete, tile, or Duralite roof (77.2%); electricity (75.7%); television (64.5%); floor other than dirt (64.4%); water faucet in the house or on the patio (48.8%); gas or electric stove (47.6%); refrigerator (39.7%); toilet (37.2%); automobile (12.2%); telephone (11.5%); and four or more rooms (8.5%) (Asociación Demográfica Salvadoreña and Centers for Disease Control, 1994, Appendix A).

twelve goods and services available in the respondent's household, where each item was weighted by the inverse of its prevalence. The assumption underlying this weighting scheme is that goods and services that are scarcer are worth more (Asociación Demográfica Salvadoreña and Centers for Disease Control and Prevention, 1994).

Marital status was measured as a dichotomous variable: women who were currently in a union (married or consensual union) versus those not in a union (never married, divorced, or widowed combined). Place of residence was measured as residence in the capital city (San Salvador), in other urban areas, and in rural areas respectively. We created a dummy variable measuring sexual initiation (ever sexually active versus not), and another to measure whether the women had ever used contraceptives. Finally, we included a variable measuring whether the respondent had ever had a Pap Smear as an indicator of linkage to the modern health care system.

## Results

### Women who had not heard of HIV/AIDS

Overall, 86 (1.4%) respondents reported that they had never heard of HIV/AIDS or did not believe that it existed. Women who gave these answers tended to be younger and less educated, to have lower socioeconomic status scale scores, to live in rural areas, and to be less likely to have ever used contraception or had a Pap Smear. To assess the relative importance and statistical significance of each of these variables, we estimated a logistic regression model to obtain adjusted odds ratios (AORs) (results not shown). Age (AOR = 0.968,  $p < 0.05$ ); education (AOR = 0.739,  $p < 0.001$ ), and sexual activity (AOR = 0.398,  $p < 0.05$ ) were significantly associated with not knowing about HIV/AIDS; younger, less educated women who were sexually active were more likely to not know about AIDS. Additionally, living in the capital city reduced significantly the odds that women had not heard of HIV/AIDS (AOR = 0.320,  $p < 0.05$ ). Although respondents who had not heard about HIV/AIDS are presumably among the least knowledgeable persons in the population with respect to HIV transmission, we excluded them from our analytic sample for the pragmatic reason that they had missing values on all of the other knowledge and perceived risk items.

### Total, correct, and incorrect HIV transmission knowledge

The mean score on the total HIV transmission knowledge scale was 62.8% correct, with an observed

Table 3  
Correlates of total HIV/AIDS transmission knowledge, 1993 El Salvador National Family Health Survey<sup>a</sup>

Variable (reference category)	Unadjusted		Adjusted		Beta
	<i>b</i>	(SE)	<i>b</i>	(SE)	
Age (15–49 years)	–0.120	(0.020)***	–0.090	(0.023)	–0.057***
Education (1–16 years)	1.158	(0.041)***	0.953	(0.050)	0.281***
Socioeconomic status (0–44.9)	0.306	(0.018)***	0.036	(0.021)	0.026
Currently in union (No)					
Yes	–0.654	(0.389)	0.441	(0.472)	0.015
Residence (rural area)					
Capital City	7.867	(0.454)***	2.566	(0.524)	0.078***
Other Urban Area	4.406	(0.459)***	0.888	(0.471)	0.027
Sexually active (No)					
Yes	–2.223	(0.450)***	–1.883	(0.664)	–0.053**
Used contraceptives (No)					
Yes	2.691	(0.386)***	2.304	(0.485)	0.076***
Had Pap smear (No)					
Yes	2.934	(0.385)***	3.162	(0.499)	0.104***
Intercept	–	–	56.843	(0.722)***	
R <sup>2</sup>	–	–	0.14		
No. of cases	6121		6121		

<sup>a</sup> Significance Levels: \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

range 0 to 83.3% correct. Thus, no respondent got more than 10 of the 12 items correct. With respect to correct HIV transmission knowledge (i.e. knowledge of the documented modes of transmission), the mean score on the correct knowledge scale was 92.7. The observed range was 0 to 100% correct. Despite the high average level of correct knowledge, the mean score on the incorrect HIV transmission knowledge scale was also high (61.8%), with an observed range of 0 to 100. Taken together, these results suggest that knowledge of the documented modes of HIV transmission do not allow women to exclude from the plausible numerous undocumented modes of HIV transmission.

To explore this notion further, we examined the correlation between the correct and incorrect knowledge scales. The correlation was only –0.06; although statistically significant (due in part to the large sample size), we consider this very low correlation an indication that correct and incorrect knowledge are substantively distinct.

#### *Correlates of total, correct, and incorrect HIV transmission knowledge*

##### *Total HIV transmission knowledge*

Despite the fact that the correct and incorrect HIV transmission knowledge scales that we constructed were only weakly correlated, we began with an analysis of overall HIV transmission knowledge that incorporated together all of the items. We did this in part

because, on their face, each of these items seems to be an indicator of HIV transmission knowledge. We also did this to allow for comparisons with other studies that have employed such global scales, and because such an analysis provides a useful referent for the subsequent analyses of correct and incorrect HIV transmission knowledge respectively.

Table 3 presents the results of bivariate and multivariate OLS regression analyses of total HIV transmission knowledge. Higher scores on the total knowledge scale represent more accurate understanding of both documented and undocumented modes of transmission; lower scores represent inaccurate understandings of documented and/or undocumented modes of transmission. As seen in Table 3, each variable was associated with total knowledge at the bivariate level, with the exception of union status. Consistent with our expectations, higher educational attainments, living in the capital city, having ever used contraceptives, and having ever had a Pap Smear significantly increased total HIV transmission knowledge net of other factors. Surprisingly, being sexually active significantly decreased total knowledge scale scores. Older age was also associated significantly with lower levels of total HIV transmission knowledge, contrary to our expectation.

##### *Correct HIV transmission knowledge*

Table 4 presents the results of bivariate and multivariate OLS regression analyses of correct HIV transmission knowledge. Higher scores on the correct

Table 4  
Correlates of correct HIV/AIDS transmission knowledge, 1993 El Salvador National Family Health Survey<sup>a</sup>

Variable (reference category)	Unadjusted		Adjusted		Beta
	<i>b</i>	(SE)	<i>b</i>	(SE)	
Age (15–49 years)	0.083	(0.024)**	0.052	(0.029)	0.027***
Education (1–16 years)	0.584	(0.051)***	0.612	(0.063)	0.151***
Socioeconomic status (0–44.9)	0.133	(0.021)***	–0.039	(0.027)	–0.023
Currently in union (No)					
Yes	1.255	(0.465)**	–0.196	(0.596)	–0.005
Residence (rural area)					
Capital city	4.204	(0.553)***	1.643	(0.662)	0.042*
Other urban area	2.992	(0.560)***	1.261	(0.595)	0.032*
Sexually active (No)					
Yes	1.863	(0.539)**	0.104	(0.840)	0.002
Used contraceptives (No)					
Yes	4.012	(0.460)***	2.281	(0.612)	0.063***
Had Pap smear (No)					
Yes	4.194	(0.460)***	2.545	(0.630)	0.070***
Intercept	–	–	84.895	(0.913)***	
<i>R</i> <sup>2</sup>	–	–	0.04		
No. of cases	6121		6121		

<sup>a</sup> Significance levels: \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

knowledge scale reflect more accurate understanding of the documented modes of transmission only; the undocumented modes of transmission are not incorporated into the construction of the correct HIV transmission knowledge scale. As seen in Table 4, each variable was significantly associated with correct HIV transmission knowledge at the bivariate level, and the direction of the associations were as hypothesized. In the adjusted model, higher levels of education, living in the capital city or other urban areas (respectively compared to rural areas), older age, having ever used contraceptives, and having ever had a Pap Smear were each independently associated with increased correct HIV transmission knowledge.

#### *Incorrect HIV transmission knowledge*

Table 5 presents the results of bivariate and multivariate OLS regression analyses of incorrect HIV transmission knowledge. We constructed this scale such that higher scores reflect more inaccurate understanding of (i.e. more belief in) the undocumented modes of transmission only; the documented modes of transmission are not incorporated into the construction of this scale. As seen in Table 5, each variable was significantly associated with incorrect HIV transmission knowledge at the bivariate level. It is noteworthy that some of the associations are in the same directions as for correct HIV transmission knowledge (which is counterintuitive if these scales are measuring the same underlying construct), while others are in the opposite direction. In the adjusted model, which included a con-

trol for correct knowledge, higher levels of education, living in the capital city or other urban areas (respectively compared to rural areas), ever having used contraceptives, and ever having had a Pap Smear each independently decreased incorrect HIV transmission knowledge. Older age significantly increased incorrect knowledge net of other factors.

We included correct knowledge in the model in order to examine the co-occurrence of correct and incorrect HIV transmission knowledge, and the relationship between them. At the bivariate level, higher levels of correct HIV transmission knowledge were associated significantly with less incorrect knowledge. However, net of the other covariates, correct HIV transmission knowledge was not significantly associated with incorrect HIV transmission knowledge. These results highlight the importance of considering the co-occurrence of correct and incorrect HIV transmission knowledge, since higher levels of correct transmission knowledge did not significantly lower levels of incorrect knowledge net of other factors.

#### *The influence of correct and incorrect HIV transmission knowledge on perceived risk*

Reports of the extent to which respondents perceived themselves to be at risk for HIV/AIDS and the degree of risk allowed for a two-part analysis of perceptions of perceived risk for HIV/AIDS: any risk and degree of risk among those with some risk. In each of the stages of this analysis, we estimated a multinomial

Table 5  
Correlates of incorrect HIV/AIDS transmission knowledge, 1993 El Salvador National Family Health Survey<sup>a</sup>

Variable (reference category)	Unadjusted		Adjusted		Beta
	<i>b</i>	(SE)	<i>b</i>	(SE)	
Age (15–49 years)	0.373	(0.032)***	0.319	(0.037)	0.127***
Education (1–16 years)	–1.604	(0.066)***	–1.256	(0.082)	–0.232***
Socioeconomic status (0–44.9)	–0.383	(0.028)***	–0.042	(0.035)	–0.019
Currently in union (No)					
Yes	2.617	(0.619)***	–0.062	(0.768)	–0.001
Residence (rural area)					
Capital city	–9.431	(0.731)***	–2.377	(0.853)	–0.046**
Other urban area	–5.642	(0.740)***	–0.860	(0.766)	–0.016*
Sexually active (No)					
Yes	5.596	(0.716)***	1.971	(1.081)	0.035
Used contraceptives (No)					
Yes	–1.513	(0.617)*	–2.963	(0.789)	–0.061***
Had Pap smear (No)					
Yes	–1.317	(0.617)*	–3.359	(0.812)	–0.070***
Correct HIV transmission knowledge (0–100)	–0.083	(0.017)***	–0.021	(0.017)	–0.016
Intercept	–	–	65.109	(1.827)***	
<i>R</i> <sup>2</sup>	–	–	0.11		
No. of cases	6121		6121		

<sup>a</sup> Significance levels: \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

Table 6  
Multinomial logistic regression analysis of the influence of correct and incorrect HIV/AIDS transmission knowledge on perceptions of risk for HIV/AIDS, 1993 El Salvador National Family Health Survey<sup>a</sup>

Variable (reference category)	Unadjusted models (reference category is no risk)				Adjusted model (reference category is no risk)			
	At risk		Don't know		At risk		Don't know	
	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)
Age (15–49 years)	1.010	(0.003)**	1.004	(0.004)	1.003	(0.004)	0.984	(0.005)**
Education (1–16 years)	0.990	(0.004)	0.900	(0.009)***	1.005	(0.009)	0.919	(0.011)***
Socioeconomic status (0–44.9)	0.999	(0.003)	0.980	(0.004)***	0.995	(0.004)	1.003	(0.005)
Currently in union (No)								
Yes	1.032	(0.062)	1.276	(0.101)**	0.837	(0.064)*	1.081	(0.114)
Residence (rural area)								
Capital city	0.987	(0.071)	0.659	(0.063)***	1.061	(0.092)	1.030	(0.122)
Other urban area	1.068	(0.077)	0.732	(0.069)**	1.121	(0.088)	0.980	(0.101)
Sexually active (No)								
Yes	1.279	(0.090)***	1.467	(0.141)***	1.276	(0.141)*	1.201	(0.179)
Used contraceptives (No)								
Yes	1.201	(0.071)**	0.987	(0.777)	1.166	(0.095)	0.957	(0.099)
Had Pap smear (No)								
Yes	1.108	(0.066)	1.048	(0.082)	0.928	(0.077)	1.162	(0.124)
Correct HIV transmission knowledge (0–100)	1.008	(0.002)***	0.985	(0.002)***	1.007	(0.002)***	0.988	(0.002)***
Incorrect HIV transmission knowledge (0–100)	1.007	(0.001)***	1.015	(0.002)***	1.007	(0.001)***	1.010	(0.002)***
No. of cases	6121		6121					

<sup>a</sup> Significance levels: \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.



Table 7

Multinomial logistic regression analysis of the influence of correct and incorrect HIV/AIDS transmission knowledge on degree of perceived risk among those who perceive themselves to be at risk for HIV/AIDS, 1993 El Salvador National Family Health Survey<sup>a</sup>

Variable (reference category)	Unadjusted models (reference category is low risk)				Adjusted model (reference category is low risk)			
	High Risk		Don't know		High Risk		Don't know	
	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)
Age (15–49 years)	0.997	(0.005)	1.030	(0.009)**	0.993	(0.007)	1.030	(0.012)**
Education (1–16 years)	0.935	(0.011)***	0.901	(0.019)***	0.936	(0.014)***	0.964	(0.027)
Socioeconomic status (0–44.9)	0.985	(0.005)**	0.967	(0.010)**	0.999	(0.007)	0.998	(0.012)
Currently in union (No)								
Yes	0.869	(0.092)	1.186	(0.216)	0.819	(0.113)	1.018	(0.238)
Residence (rural area)								
Capital city	0.779	(0.099)†	0.783	(0.101)†	1.093	(0.169)	0.438	(0.128)**
Other urban area	0.318	(0.077)***	0.508	(0.107)**	0.997	(0.140)	0.623	(0.145)*
Sexually active (No)								
Yes	1.034	(0.131)	1.466	(0.346)	1.002	(0.195)	0.811	(0.288)
Used contraceptives (No)								
Yes	0.875	(0.092)	0.994	(0.178)	0.988	(0.146)	1.070	(0.261)
Had Pap smear (No)								
Yes	0.846	(0.089)	0.910	(0.163)	0.986	(0.149)	0.816	(0.203)
Correct HIV transmission knowledge (0–100)	1.002	(0.005)	0.979	(0.005)***	1.002	(0.005)	0.980	(0.005)***
Incorrect HIV transmission knowledge (0–100)	1.009	(0.002)***	1.014	(0.004)***	1.006	(0.002)*	1.008	(0.004)†
No. of cases	1614		1614					

<sup>a</sup> Significance levels: \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ ; † $p < 0.06$ .

logistic regression model that allowed us to take account of those who responded don't know (i.e. those who were uncertain about whether they were at risk or the extent to which they were). The results of these analyses are presented in Tables 6 and 7 as odds ratios (OR) (rather than regression coefficients).

#### Perceptions of any risk for HIV/AIDS

Table 6 presents the results of a multinomial logistic regression analysis of any risk for HIV/AIDS; bivariate results are presented for comparison purposes, but generally will not be discussed in the text. The results presented in Table 6 indicate that both persons with higher correct and persons with higher incorrect HIV transmission knowledge scale scores were significantly more likely to perceive themselves as being at risk. However, the effects of correct and incorrect knowledge operated differently for uncertainty about risk. Persons with higher levels of correct HIV transmission knowledge were significantly less likely to be uncertain about whether they were at risk for HIV/AIDS, while persons with higher incorrect knowledge scale scores were significantly more likely to be uncertain about whether they were at risk.

Other variables were also associated with percep-

tions of increased and uncertain risk. Persons currently in a union were significantly less likely to perceive themselves as being at risk, while those who were sexually active were significantly more likely to perceive themselves as being at risk net of other factors. Older age and higher levels of education each significantly reduced the odds of being uncertain about risk net of other factors.

#### Perceived degree of risk among those self-identified as being at risk for HIV/AIDS

Table 7 presents the results of a multinomial logistic regression analysis of degree of risk perceived among El Salvadoran women who believed that they were at some risk for HIV/AIDS. Among these women, higher levels of incorrect HIV transmission knowledge were associated significantly with an increased likelihood of perceiving high risk (as opposed to low risk). Additionally, these women were marginally ( $p < 0.06$ ) more likely to express uncertainty about how much risk they were at. Given some risk, those who had higher correct knowledge scale scores were significantly less likely to express uncertainty about how much risk they were at.

Among women who perceived themselves as being at risk for HIV/AIDS, the only other variable that was

associated with perceived high risk was education; better educated women were less likely to report themselves as being at high risk. With respect to uncertainty about the degree of risk, the odds were significantly higher for older women and significantly lower for women living in the capital city and in other urban areas.

#### *Supplemental analyses*

In order to explore whether the effects of correct and incorrect knowledge on perceived risk varied by whether respondents were sexually active (i.e. the most likely form of *actual* risk in this population), we re-estimated the models presented in Tables 6 and 7 with interaction terms specified for the variable measuring sexual activity status and each of the knowledge scales. In no case was an interaction term statistically significant. Additional supplemental analyses indicated that some sexually inactive women ( $N = 255$ ) perceived themselves to be at risk for HIV, and that a small proportion of these women perceived themselves to be at high risk. In the likely absence of actual risk for HIV among these women, it would seem that social and cultural beliefs about contagion (which exist in both developing and developed societies) or fears about future sexual activity were translated into perceived risk.

#### **Discussion**

In this paper, we have further documented and analyzed the co-occurrence of correct and incorrect HIV transmission knowledge among women of childbearing age in El Salvador (for additional data, see Asociación Demográfica Salvadoreña and Centers for Disease Control and Prevention, 1994). Average levels of accurate knowledge of six documented modes of HIV transmission were above 90% correct. Despite high levels of accurate knowledge about documented modes of HIV transmission, belief in undocumented modes of HIV transmission was also high. Women inaccurately endorsed, on average, more than 60% of the items indexing undocumented modes of HIV transmission. While one might assume that the correlation between correct and incorrect knowledge would be relatively strong and negative, we found that it approached zero ( $-0.06$ ). Taken together, these descriptive results suggest that incorrect beliefs about HIV transmission not only co-occur with accurate knowledge about transmission, but are also largely independent of accurate knowledge. This conclusion was supported by our multivariate analyses, which showed that correct HIV transmission knowledge was not significantly associated with incorrect knowledge once other variables were taken into account. Thus, overall, we find little

evidence to suggest that high levels of correct HIV transmission knowledge alone can reduce beliefs in incorrect HIV transmission knowledge.

It is not clear why there is such a disjunction between knowledge about documented and undocumented modes of HIV transmission. One possible explanation is that we have not measured HIV transmission knowledge well. We are not inclined toward this explanation, as the relationships we observed between numerous other variables and our various HIV transmission knowledge scales were mostly as expected. For example, education, living in the capital city, and evidence of contact with the modern health care system (i.e. having ever used contraceptives and having ever had a Pap Smear) consistently had positive and significant net associations with total and correct HIV transmission knowledge, and negative and significant net associations with incorrect HIV transmission knowledge.

We are more inclined to argue that the items that comprise the correct and incorrect HIV transmission knowledge scales refer to different constructs. Those items that refer to the documented modes of HIV transmission probably index knowledge acquired from the media, prevention campaigns, or health services; these are the widely-accepted, authoritative, medical-scientific, and governmentally-endorsed modes of transmission. The other set of factors reflect these scientific understandings, but also reflect, and are filtered by, more general beliefs about contagion and disease not strictly related to HIV/AIDS. Belief in undocumented modes of transmission may reflect cultural anxieties and non-rational influences on "knowledge," what Mary Douglas (1966) has called pollution beliefs.

This kind of cultural filtering and sense-making that has been shown to operate in many contexts is consistent with models of risk assessment (Douglas & Wildavsky, 1982; Heimer, 1988; Nelkin, 1989; Teuber, 1990), and thus need not be considered a strictly "developing country" phenomenon. For example, Maticka-Tyndale (1992) found that her young adult respondents in Montreal possessed accurate scientific knowledge, but used common sense or folk knowledge to guide their actions. The predominant rule of protection used by her respondents was to achieve protection through the selection of uninfected partners (see also VanLandingham et al., 1997 for a discussion of HIV/AIDS knowledge in relation to the selection of "clean" sex workers). Maticka-Tyndale (1992, p. 242) states that "folk or common sense knowledge consisted of scientifically based knowledge filtered through [the respondents'] experiences and those of their peers." In constructing the threat posed by AIDS, respondents equated the fatality of AIDS to other "fatal disasters," thus concluding that their fear of AIDS was the same

as that of other potentially lethal occurrences (Maticka-Tyndale, 1992, p. 243).

Situating our results in this kind of interpretive framework provides a potential mechanism for understanding why higher levels of correct knowledge would lead to higher levels of incorrect knowledge in the context of El Salvador (and elsewhere). As people “know” more, they are able to fear more; inaccurate beliefs about HIV transmission emerge when new information is introduced (i.e., scientific information about HIV transmission) and assimilated into existing cultural frameworks for understanding contagion and disease. If our interpretation is correct, then knowledge about the documented modes of transmission alone is not likely to be sufficient to promote accurate assessments of risk and behavioral changes. Efforts to counteract inaccurate beliefs about transmission will also be important. We believe that further qualitative exploration of this co-occurrence phenomenon, the meanings people attribute to these various documented and undocumented modes of transmission, and how people reconcile what they “know” and what they believe, are warranted.

In this paper, we also examined the relationship between correct and incorrect knowledge and perceived risk for HIV/AIDS. We estimated a two-part model to assess perceived risk. In the first part, we identified factors that were associated with perceptions of any risk for HIV and uncertainty about risk respectively, versus no risk. In the second part, we identified factors associated with high and uncertain risk respectively, versus low risk, among the subset of women who perceived themselves to be at some risk for HIV/AIDS. We hypothesized that having lower levels of correct HIV transmission knowledge and higher levels of incorrect transmission knowledge would be associated with higher levels of perceived risk and uncertainty about risk.

Overall, we found substantial support for these hypotheses. The odds of perceiving oneself to be at risk were significantly higher among those with higher levels of correct HIV transmission knowledge, while higher levels of correct HIV transmission knowledge significantly reduced the odds that women were uncertain about whether they were at risk. Higher levels of incorrect knowledge also increased the odds that women perceived themselves to be at risk; however, in contrast to correct HIV transmission knowledge, higher levels of incorrect HIV transmission knowledge increased uncertainty about their risk. That more accurate knowledge about documented modes of transmission was related to increased perceptions of risk is noteworthy; it raises important questions about the extent which El Salvadoran women who accurately know they are at risk for HIV are able to translate that knowledge into preventive action.

For women who perceived themselves to be at some

risk of HIV/AIDS, higher levels of correct knowledge reduced uncertainty about their degree of risk, but did not significantly differentiate those who perceived high versus low risk. Higher levels of incorrect knowledge increased the odds that women perceived themselves to be at high risk (rather than low risk), and marginally increased uncertainty about risk. Taken together, these results are largely consistent with what we hypothesized. Correct knowledge offers some protection against uncertainty, and may offer women tools to accurately assess their own risk (even if they cannot reduce that risk). Incorrect knowledge increases perceptions of risk and uncertainty overall, and, among those who perceive themselves to be at some risk, the degree of risk they perceive.

Our results suggest that HIV/AIDS prevention campaigns that solely aim to promote understanding of the documented modes of HIV transmission are not likely to be sufficient. In order to increase the odds that people will be able to assimilate and use information about modes of HIV transmission to accurately assess their risk and change their behavior, direct efforts must be made to undermine inaccurate beliefs about transmission. This conclusion is consistent with previously published recommendations (Ingham, 1995; VanLandingham et al., 1997). The assumption that people will be able to rule out implausible modes of transmission if they have accurate knowledge about documented modes of transmission is not borne out by these results. Replications of the analyses using data from other populations are warranted, as are direct efforts to counteract beliefs about undocumented modes of HIV transmission.

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