A Comparison of Voluntary Counseling and Testing Uptake Between a China CARES County and a County Not Designated for the China CARES Program

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ABSTRACT

A cross-sectional study employing two-stage cluster sampling was conducted between December 2005 and March 2006 to compare adults' knowledge of HIV/AIDS voluntary counseling and testing (VCT) and the attitudes toward and acceptance of VCT between a county in which a comprehensive HIV/AIDS program, China CARES (CC), was available, and a county where it was not. Information on HIV/AIDS knowledge, awareness of VCT, and attitudes was collected. All participants were given a coupon for free VCT after the cross-sectional interview. Uptake of VCT was measured within 2 months of the interview. More participants in the CC county knew someone infected with HIV, had participated in AIDS-related activities, and/or had heard about China CARES. In the control county, education and income levels were higher, there were fewer minorities, and there was a higher proportion of women. VCT uptake was low. Overall, no significant differences in uptake were found between the two counties. Urban residents of the CC county had higher HIV/AIDS knowledge levels than urban residents of the comparison county ($p = 0.002$). Residents of the CC county were more discriminative against HIV/AIDS and persons living with HIV/AIDS (PLWHA) and had lower perceptions of risk. The differences may be due to the higher proportion of rural residents in the CC county ($p < 0.001$). The China CARES program may have had a positive effect on urban areas of Guizhou Province in terms of improving HIV/AIDS and VCT knowledge and reducing discrimination, but had little impact in the rural areas. If the China CARES program is to be successful, it must implement a more effective education program and increase the acceptability of testing.

INTRODUCTION

IN CHINA, the HIV epidemic is spreading dramatically. Although the overall adult preva-

lence rate is less than 0.1%, the epidemic has spread to 31 provinces over a period of 14 years (1985–1999),¹ and there is a high prevalence in specific populations and certain regions. Since

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2001, China has had increasing numbers of AIDS cases and AIDS-related deaths. As of 2005, an estimated 650,000 people in China had been infected with HIV/AIDS, among whom 75,000 have AIDS.² Although the main transmission routes are through intravenous drug use and, in the past, through commercial donation of plasma, the HIV/AIDS epidemic is now spreading from high-risk populations to the general population. Data from sentinel surveillances indicate that HIV prevalence among sex workers is increasing, and mother-to-child transmission (MTCT) has continued to increase since the first reported case of MTCT in 1995.^{1,2} Unless the AIDS epidemic is controlled, HIV/AIDS will become a serious problem threatening national security and prosperity, social stability, and economic development in China.

In 2002, the China Ministry of Health (MOH) indicated the intention to establish a 127-county community-based HIV/AIDS comprehensive care and treatment program, "China CARES," in key regions with the greatest number of HIV/AIDS cases. In 2003, the MOH initiated the China CARES program by establishing 51 community-based HIV/AIDS comprehensive care pilot centers in regions with the greatest number of HIV/AIDS cases in 11 provinces: Hubei, Guizhou, Hunan, Anhui, Liaoning, Hebei, Shaanxi, Shanxi, Shandong, Henan, and Heilongjiang. This program includes the provision of treatment with domestically produced antiretroviral drugs, health care and education, intervention programs, MTCT prevention, and voluntary counseling and testing (VCT). The number of pilot sites increased to 127 within 1 year.^{1,3} However, the effectiveness of the China CARES program has not been evaluated.

Guizhou Province is one area where the China CARES program is operating. Guizhou Province is located in the mountainous southwest, has an area of 176,167 km², and has 10 cities and 79 counties. The population was 38.37 million in 2002. The majority of the population lives in rural areas. Han (the major ethnic group in China) comprise 62.1% of the total population. Other ethnicities/races include Miao, Buyi, Tong, Tujia, and Yi. Guizhou Province is one of the least developed provinces in

China. In 2002, the per capita income per year of farmers was RMB 1490 (approximately \$180).^{4,5}

HIV infection was first reported in Guizhou in 1993. By the end of March 2004, a total of 1047 HIV cases were reported officially, ranking Guizhou tenth for HIV prevalence among provinces in China. Since 1998, 76% of HIV infections have been associated with injection drug use.^{1,6} Guizhou is one of the seven provinces in China that has more than 10,000 injection drug users (IDUs) infected with HIV, and is one of the nine provinces that reported an HIV prevalence rate exceeding 5% among IDUs.^{1,2} As in other areas of China, the majority of drug users are male, young, single, and have little education.⁷ One study indicated that the HIV prevalence among IDUs in some areas of Guizhou is as high as 34%.¹ It is estimated that the actual number of HIV infections in Guizhou is about 30,000.⁸

Between December 2005 and March 2006, we conducted a study in two counties of Guizhou Province to evaluate the China CARES program in terms of promoting testing and increasing HIV/AIDS knowledge, as well as identifying persons who needed treatment. The objective of the study was to compare the perceptions and acceptance of VCT and levels of HIV knowledge among adults in one county in which the China CARES program had been implemented (CC county) and another where it had not (control county).

METHODS

Study design

This study used a cross-sectional design with two-stage cluster sampling and a subsequent follow-up study within 2 months after the cross-sectional study to measure and compare uptake of VCT by participants in the two areas.

Selection of study areas

There are five counties in Guizhou Province in which China CARES is operating. We selected a county with the highest HIV prevalence among the China CARES counties where the HIV epidemic is driven by injection drug

use. Another county with similar estimated prevalence of HIV and IDUs and demographic characteristics was selected as the comparison county.

Participants

The source population was all adults aged 18–45 years who resided in Guizhou Province. A cluster sample of residents was recruited from both the CC and the control county. Inclusion criteria were 1) having resided in the village/community for at least 6 months; 2) being 18–45 years of age; and 3) willingness to participate in the interview. The total sample size was 1012: 500 in the CC county and 512 in the control county.

Sampling method

A two-stage cluster sampling strategy with probability proportionate to size of population at the first stage and a constant number of subjects per cluster at the second stage was used to recruit participants.

To comply with statistical assumptions,⁹ we sampled 25 clusters, with 20 participants in each cluster. The population in each county was divided into geographically defined clusters of known size. The clusters were listed, with the population size included in a cumulative tally. After a random start, a systematic sample of 25 clusters was drawn from the cumulative population list. Because larger clusters would contribute more to the cumulative population list than smaller clusters, the probability of being included in the sample was made proportionate to the size of the cluster (PPS sampling).¹⁰ For the second stage, if the list of residents or households was available, residents aged 18–45 years were randomly selected from the village/community population list until a total of 20 eligible residents in that cluster had been enrolled. If the list was not available, we chose a central point in the village/community and selected a random direction from that point, counted the number of households between the central point and the edge of village/community in that direction, then selected one house at random as the starting point. We assumed that the households were randomly distributed within the vil-

lage/community. The remaining households in the sample were selected to give as wide-spread coverage as possible of the village/community consistent with practicality; for example, the fifth or tenth nearest household to the previous household. In the case of dwellings containing multiple households, only one household was selected from that dwelling. All eligible adults in the selected households were asked to participate in the study, until a total of 20 eligible residents from that cluster had been enrolled.¹¹

Data collection and management

The study instrument included a standardized questionnaire, which was administered face-to-face to all subjects. All questions were pilot tested on persons outside our sample for clarity and appropriate wording. The questionnaire included sections for demographic and socioeconomic characteristics, knowledge of HIV/AIDS, relationships with others, risk behaviors for HIV infection, and experience with and attitudes toward VCT. Sensitive information was collected using a self-administered questionnaire using a CD player and earphones. The answer sheet contained only question numbers and answer codes, with no identifying information.

After administration of the questionnaire in phase two, each participant was offered a coupon for free VCT services at designated facilities. The participant received an incentive for returning the coupon, even if he/she did not get tested. The testing was anonymous and voluntary. A brief follow-up interview was conducted when the coupon was returned without the bearer being testing, to ask the reasons for not being tested.

Data analysis

A data entry program in EpiData 3.1¹² was designed to automatically screen impossible and illogical values for each variable. Data were input into the computer by two different staff members, and the two datasets were compared to check for errors in data entry. For data analysis, knowledge about HIV/AIDS was assessed using a total score calculated from responses to the questions about knowledge of

TABLE 1. DEMOGRAPHIC CHARACTERISTICS AND HIV/AIDS AND VCT INFORMATION FROM STUDY COUNTIES

	<i>China CARES</i>	<i>Control</i>
Area (km ²)	2868	1964
County GDP (billion yuan)	1.795	1.622
County population	924,000	463,500
Year of first reported case of HIV	1996	2000
Year of first reported case of AIDS	2003	2005
Cumulative reported cases of HIV/AIDS	321	80
Cumulative number tested for HIV	10,593	1382
Year VCT started	2003	2004
Number completing VCT	2,108	147
Number of VCT sites	5	1

VCT, voluntary counseling and testing.

HIV/AIDS, with each correct answer scoring one point.

Means and standard deviations were presented for describing continuous variables. Frequency tables with point estimates and confidence intervals were constructed to describe categorical variables. The mean score and confidence intervals for knowledge about HIV/AIDS were calculated. Descriptive analyses were conducted for each county individually and compared to each other.

Contingency tables and bivariate analysis were conducted to assess associations between covariates and outcome. Odds ratios with 95% confidence intervals were estimated, using methods appropriate for cluster sampling data. Variables found to be statistically significantly associated with the outcome variables in bivariate analyses were examined for co-linearity. Correlation analyses were performed, and one of each pair of variables found to have a correlation coefficient >0.8 was eliminated from additional analysis.

Multilevel analyses were performed to further adjust for confounding. A random-effects logistic regression model was used to handle the problems of within-group dependence in this stage. The underlying assumption was that the group-specific regression parameters were random samples from a population of such parameters. By combining results from both levels, we could predict outcome as a function of individual factors, ecologic factors, and their interaction terms.

We used the following multilevel logistic regression model with random effects for the

cluster-level covariates to estimate individual and cluster level effects on outcome:

$$Y_{ij} = P_{ij} + R_{ij}$$

$$\log \text{it}(P_{ij}) = \gamma_0 + \sum_{h=1}^r \gamma_h x_{hij} + U_{0j}$$

where Y_{ij} is the dichotomous outcome for individual i in cluster j , P_{ij} is the success probability, R_{ij} is level 1 (individual) residual, λ_0 is the intercept, x_{hij} are the explanatory variables, r is the number of explanatory variables, λ_h is a coefficient of the h^{th} variables, and U_{0j} is level 2 (cluster) random effect having a normal distribution with mean zero and a variance of τ_0^2 .

The intra-class correlation coefficient was calculated to measure how much of the variability could be explained by the differences between clusters. The formula for calculating intra-class correlation coefficients was $\tau_0^2 / (\tau_0^2 + \sigma^2)$, which is a ratio of the variation of the random effects over the total variation of the outcome variable.¹³

Descriptive, crude, and correlation analyses were conducted using SAS software (version 9.1.3; SAS Institute, Cary, NC). To account for survey design factors, the new SURVEYMEANS, SURVEYFREQ, SURVEYREG, and SURVEYLOGISTIC were used. Multilevel analysis was conducted using Stata software XTLOGIT command (version 8.0, StataCorp, College Station, TX).¹⁴

Human subjects protection

This study was approved by the institutional review boards of the University of California,

TABLE 2. DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS IN THE TWO STUDY COUNTIES

	China CARES (n = 500)		Control (n = 512)		χ^2 ^b	p value
	N	% ^a	N	% ^a		
Age (years)					4.544	0.208
18–19	18	3.7	21	4.2		
20–29	107	21.6	142	27.9		
30–39	256	52.1	245	47.7		
40–45	113	22.7	104	20.2		
Gender					7.150	0.008
Male	250	50.3	226	44.2		
Female	250	49.7	286	55.8		
Family income						<0.001 ^c
≤2500	79	17.2	14	3.2		
~2500	159	34.7	111	25.4		
~5000	130	27.9	229	53.9		
~10,000	67	14.5	63	15.1		
>25,000	27	5.8	11	2.5		
Education						<0.001 ^c
Never attended school	89	18.0	9	1.7		
Elementary	167	33.3	163	31.4		
Secondary	154	31.1	219	43.2		
High school	63	12.7	69	13.5		
College/university	26	5.0	52	10.2		
Ethnicity					9.868	0.002
Han	369	74.0	452	89.2		
Other	128	26.0	60	10.8		
Religion					2.653	0.103
No religion	482	97.7	483	94.6		
Religious	11	2.3	28	5.4		
Occupation					3.957	0.047
Farmer	275	55.8	169	32.8		
Other	223	44.2	343	67.2		
Marital status					0.361	0.548
Married/cohabiting	445	89.2	450	87.7		
Single/divorced/widowed	55	10.8	62	12.3		

^aWeighted percentage accounting for study design.

^bAll χ^2 s are Rao-Scott χ^2 s.

^cp value is based on Wilcoxon rank-sum exact tests.

Los Angeles and the China National Center for AIDS/STD Control & Prevention.

RESULTS

Study sites

Demographic characteristics and HIV/AIDS and VCT information from the two counties are listed in Table 1.

Demographic characteristics

Six hundred seventy-six households were visited, from which 1289 eligible persons were identified. A total of 1012 (78.5%) participants

completed the main questionnaire. Fifteen persons (1.2%) refused to participate. Other non-responding participants were not at home at the times of the visit (rural clusters) or after three attempts (urban clusters).

About half of participants in our study were 30–40 years old (Table 2). The mean age of participants in the CC county was 33.5 (median = 34) and 32.5 (median = 32) in the control county. More female participants were sampled in the control county. Family incomes of participants in the control county were higher than those in the CC county. Education levels were also higher in the control county. Eighty-nine (18%) participants in the CC county had never attended school. Altogether, 80.1% of

TABLE 3. HIV/AIDS KNOWLEDGE AND ATTITUDES OF PARTICIPANTS IN THE TWO STUDY COUNTIES^a

	<i>China CARES (n = 500)</i>		<i>Control (n = 512)</i>		χ^2 ^c	<i>p value</i>
	N	% ^b	N	% ^b		
Ever heard of HIV/AIDS	386	77.2	466	91.2	10.829	0.001
Self-estimated knowledge					5.750	0.017
≤4	146	43.4	211	55.3		
>4	192	56.6	167	44.7		
GENERAL KNOWLEDGE						
AIDS is an infectious disease (T ^d)	397	79.3	459	86.7	8.822	0.003
AIDS is caused by a virus that damages the human immune system (T)	306	60.8	402	78.5	27.725	<0.001
A person with AIDS can look as healthy as other people (T)	208	41.2	263	52.0	4.435	0.035
Medical treatment can enable people to live a long time with AIDS disease (T)	252	49.8	338	66.0	10.132	0.002
TRANSMISSION ROUTE						
Having sex with someone (T)	381	76.1	441	86.2	5.903	0.015
Sharing needles with others (T)	363	72.3	425	82.9	6.024	0.014
Receiving a blood transfusion (T)	377	75.2	473	92.4	16.221	<0.001
MTCT (T)	341	67.8	426	83.1	10.924	0.001
PREVENTION MEASURES						
Cleaning needles with water (F)	217	43.2	330	64.3	20.761	<0.001
ATTITUDES TOWARD PLWHA						
Angry	338	70.1	291	56.7		<0.001
Disgusted	362	75.3	300	58.7		<0.001
PLWHA should be isolated	300	63.9	341	66.6		0.015
PLWHA got what they deserved	271	58.2	245	47.9		0.030
PLWHA should be helped	365	77.7	471	92.2		<0.001
Compulsory testing for some persons	349	74.3	466	90.9		<0.001^e
Would live together with PLWHA	123	24.9	175	34.6		0.018^e
Would eat together with PLWHA	164	33.0	225	44.4		0.025^e
Would work together with PLWHA	222	45.0	292	57.4		0.003^e
Would still consider PLWHA a friend	213	43.3	337	66.3		<0.001^e

^aOnly questions with significantly different answers are listed.

^bWeighted percentage accounting for study design.

^cAll χ^2 are Rao-Scott χ^2 .

^dCorrect answers are in brackets.

^e*p* values are based on Wilcoxon rank-sum exact tests.

MTCT, mother-to-child transmission; PLWHA, persons living with HIV/AIDS.

participants were Han ethnicity. The percentage of minority persons was higher in the CC county (26.0% vs. 10.8%). About 10% of the participants were single. The proportion who were farmers was higher in the CC county (55.8% vs. 32.8%).

HIV/AIDS knowledge

HIV/AIDS knowledge of participants was measured using a scale comprising 22 questions (Table 3). The Cronbach coefficient alphas were 0.919 for the total sample, 0.948 for the CC county, and 0.847 for the control county. The mean scores were 12.29 for the CC county and 13.79 for the control county.

HIV/AIDS knowledge levels were low among participants in both counties. Only 3 of 22 questions were correctly answered by more than 80% of participants. For questions such as unavailability of HIV vaccine, noninfectiousness of mosquito bites, and ineffectiveness of physical exercise for prevention of HIV infection, the proportion with correct answers was less than 30%.

Because knowledge scores were not normally distributed (Shapiro-Wilk tests, $p < 0.001$), a nonparametric method (Wilcoxon rank-sum test) was used to compare knowledge levels between participants in the two counties. The results showed no significant differences between the two counties ($p = 0.236$ for both normal ap-

TABLE 4. HIV/AIDS-RELATED PERCEPTIONS OF PARTICIPANTS IN THE TWO STUDY COUNTIES

	China CARES (n = 500)		Control (n = 512)		χ^2 ^b	p value
	N	% ^a	N	% ^a		
Likelihood of getting the AIDS virus						<0.001 ^c
Not possible	450	95.1	400	81.4		
Low possibility	17	3.6	77	15.8		
Possibly	2	0.4	12	2.4		
Highly likely	3	0.7	2	0.4		
Already infected	1	0.2	0	0.00		
Knew someone who had AIDS					6.854	0.009
Yes	30	5.7	5	1.0		
No	464	94.3	503	99.0		
Ever participated in any AIDS-related activities					11.531	<0.001
Yes	55	10.8	21	4.0		
No or DK	444	89.2	491	96.0		
Every heard of China CARES					13.473	<0.001
Yes	144	29.0	77	15.2		
No	354	71.0	434	84.8		
Knew about government policy regarding HIV					1.386	0.239
Yes	162	32.3	136	26.8		
No	337	67.7	375	73.2		

^aWeighted percentage accounting for study design.

^bAll χ^2 s are Rao-Scott χ^2 s.

^cp value is based on Wilcoxon rank-sum exact test.

DK, don't know.

proximation and *t* approximation). However, further analysis showed that urban residents of the CC county had higher HIV/AIDS knowledge levels than urban residents of the control county ($p = 0.002$), and conversely, rural residents of the CC county had lower HIV/AIDS knowledge levels than rural residents of the control county ($p < 0.001$).

HIV/AIDS-related attitudes and perceptions

Participants' attitudes toward HIV/AIDS and people living with HIV/AIDS (PLWHA) were measured according to responses to a series of questions (Table 3). For most questions, participants in the CC county showed more negative attitudes toward HIV/AIDS and PLWHA. A summary score (ranging between 0 and 1, with the high score indicating more negative attitudes) was created to measure participants' overall attitudes. The Cronbach coefficient alphas were 0.841 for the total sample, 0.866 for the CC sample, and 0.815 for the control sample. The mean scores were 0.657, 0.674, and 0.641, respectively. The *t* test indicated that residents in the CC county had more negative attitudes toward HIV/AIDS and PLWHA than

residents in the control county did ($p = 0.002$). Additional analysis indicated that the difference was due to the higher proportion of rural residents (who had more negative attitudes) in the CC county ($p < 0.001$). For urban residents, the difference was not significant ($p = 0.441$). Negative attitudes among rural residents were related to low education levels (*t* test, $p < 0.001$) and low HIV/AIDS knowledge levels (*t* test, $p < 0.001$).

Table 4 presents HIV/AIDS-related perceptions among participants. Less than 2% of participants thought it was possible for them to be infected with HIV. Only 26.3% of participants had ever discussed AIDS with others. As expected, more residents in the CC county knew someone who was infected with HIV, had ever participated in AIDS-related activities, or had heard of the China CARES program. Only one third or less claimed that they knew about government's policy for AIDS.

High-risk behaviors

Information on participants' high-risk behaviors was mainly (94.7%) obtained using the CD player/earphones method (Table 5). Few

TABLE 5. HIGH-RISK BEHAVIORS OF PARTICIPANTS IN THE TWO STUDY COUNTIES

	China CARES (n = 500)		Control (n = 512)		χ^2 ^b	p value
	N	% ^a	N	% ^a		
Ever shared needles/syringes					1.557	0.212
Yes	2	0.4	6	1.3		
No	484	99.6	500	98.7		
Had sex with non-spouse					63.406	<0.001
Yes	13	2.9	66	18.0		
No	410	97.1	299	82.0		
Visited a commercial sex worker					4.894	0.027
Yes	4	0.9	11	3.0		
No	421	99.1	346	97.0		
Had sex with a person of the same gender					2.059	0.151
Yes	4	0.7	8	2.2		
No	420	99.3	345	97.9		
Ever had sex with another man					2.206	0.137
Yes	1	0.3	4	1.1		
No or DK	422	99.8	356	98.9		
Ever had anal sex					48.013	<0.001
Yes	7	1.6	40	11.2		
No	416	98.4	314	88.8		
Had a diagnosed STD					3.914	0.048
Yes	4	0.9	13	3.5		
No	421	99.1	348	96.5		

^aWeighted percentage accounting for study design.

^bAll χ^2 s are Rao-Scott χ^2 s.

DK, don't know.

participants admitted that they had ever engaged in high-risk behaviors. The most frequent high-risk behavior was having sex with a person other than their spouse (8.3%). Two participants in the CC county said they had ever had sex with PLWHA. Differences between participants in the two counties were significant for several behaviors: had sex with non-spouse ($p < 0.001$), had visited a commercial sex worker ($p = 0.027$), had ever had anal sex ($p < 0.001$), and had been diagnosed with a STD ($p = 0.048$). All were higher in the control county.

A random-effects logistic regression model was fitted to identify factors related to having multiple partners. Significant factors associated with having multiple partners included living in the control county, never having heard of the China CARES program, having relatives in the cluster, having difficulty in communicating with spouse, and occupation other than farmer. Being male and being religious were marginally related to having multiple partners. The control county had fewer farmers (who are less

sexually active) and more participants who had difficulty in communicating with their spouses (Rao-Scott χ^2 test, $p = 0.030$).

HIV testing and knowledge

Participants were asked four questions to measure knowledge of VCT: "Do you know where to ask questions about AIDS?", "Do you know where to get HIV testing?", "Do you know the benefits of being tested?", and "Do you know of any negative effects for being tested?" These knowledge levels were low among participants. A total of 372 (37.8%) participants did not know where to ask questions about AIDS, and 338 (34.2%) participants did not know where to get HIV testing. Two hundred thirteen (23.1%) participants did not know of a benefit or thought there was no benefit for being tested for HIV. Only 308 (27.1%) participants thought that there were no negative effects for being tested for HIV. Residents in the control county had greater awareness of VCT than those in the CC county (Rao-Scott χ^2 , p

TABLE 6. VCT-RELATED ATTITUDES OF PARTICIPANTS IN THE TWO STUDY COUNTIES

	China CARES (n = 500)		Control (n = 512)		Total (n = 1012)		p value
	N	% ^a	N	% ^a	N	% ^a	
Reaction to seeing someone being tested							
S/he must have "done something dirty"	108	22.3	62	12.3	170	18.3	
S/he must have AIDS	58	11.6	80	15.6	138	13.2	
Would tell someone else	7	1.4	9	1.7	16	1.5	
Think they are wise to get tested	113	22.9	83	16.4	196	20.3	
Would avoid him/her	23	4.6	59	11.7	82	7.5	
No particular reaction	135	27.7	189	36.7	324	31.4	
Afraid	0	0.0	10	1.9	10	0.8	
Sympathy	2	0.4	7	1.5	9	0.8	
Decide to also get HIV testing	0	0.0	6	1.3	6	0.5	
Other	4	0.9	7	1.4	11	1.1	
Do not know	115	23.6	89	17.6	204	21.1	
How much do you agree with the statement: "AIDS counseling and testing will help prevent people from becoming infected with HIV"?							<0.001 ^b
Not at all	61	12.6	17	3.4	78	8.9	
Only agree a little	84	17.4	22	4.3	106	12.1	
Agree somewhat	117	23.6	77	15.3	194	20.2	
Agree	117	24.0	68	13.3	185	19.7	
Strongly agree	109	22.3	325	63.8	434	39.1	
Should pregnant women be tested?							0.006 ^c
Yes	303	61.1	373	72.7	676	65.8	
No or DK	193	39.0	139	27.3	332	34.2	
Should there be an effort by the government to notify the sexual partners of individuals infected with AIDS?							<0.001 ^d
Yes	338	68.4	413	80.7	751	73.3	
No or DK	160	31.6	99	19.3	259	26.7	

^aWeighted percentage accounting for study design.

^bp value is based on Wilcoxon rank-sum exact test.

^cRao-Scott $\chi^2 = 7.572$.

^dRao-Scott $\chi^2 = 18.530$.

VCT, Voluntary Counseling and testing; DK, don't know.

values for the four "do not know" answers were 0.033, 0.059, <0.001, and <0.001, respectively). The differences were more significant among rural participants, with all *p* values less than 0.001. Further analysis revealed that levels of awareness of VCT were highly related to education level (all *p* values <0.001).

VCT-related attitudes

When asked about their reactions if they saw someone being tested, 18.3% of participants thought the testee must have "done something dirty," and 13.2% thought the testee must have AIDS (Table 6). Participants were asked to in-

dicate their agreement with the statement "AIDS counseling and testing will help prevent people from becoming infected with HIV," to which 619 (58.8%) agreed or strongly agreed. For the other two questions, "Should pregnant women be tested?" and "Should there be an effort by the government to notify the sexual partners of individuals infected with AIDS?", participants in the control county showed more positive attitudes. As before, the difference was more significant among rural participants, and negative attitudes were strongly correlated to low education levels (*p* values were less than 0.001 for most questions, except the last question in Table 6 (*p* = 0.030)).

TABLE 7. ACCEPTANCE OF VCT AMONG PARTICIPANTS IN THE TWO STUDY COUNTIES

	China CARES (n = 500)		Control (n = 512)		χ^2 ^b	p value
	N	% ^a	N	% ^a		
Would you like to ask questions about AIDS?						
Yes	247	49.6	336	65.9	22.611	<0.001
No or DK	250	50.4	175	34.1		
Would you be willing to be tested?					75.555	<0.001
Yes	181	36.4	278	54.1		
No	314	63.6	234	45.9		
Would you suggest your sex partner be tested?					23.269	<0.001
Yes	82	17.0	157	33.2		
No or DK	385	83.0	319	66.8		
Visited a VCT site					28.836	<0.001
Yes	35	7.0	158	30.7		
No	465	93.0	354	69.3		
Returned to VCT and was tested					2.845	0.098
Yes	12	2.5	30	5.6		
No	488	97.5	482	94.4		

^aWeighted percentage accounting for study design.

^bAll χ^2 s are Rao-Scott χ^2 s.

VCT, voluntary counseling and testing; DK, don't know.

Acceptance of VCT

Participants were asked whether they would like to ask questions about AIDS and be tested for HIV. The answers to these questions are summarized in Table 7. Only 56.2% of all participants indicated that they would ask questions about AIDS, and only 43.5% indicated they would be tested. Less than one-quarter (23.5%) of participants indicated that they would suggest that their sex partner be tested. Residents in the control county were more likely to report willingness to accept HIV counseling and testing (all *p* values less than 0.001). Further analysis showed that urban residents were more likely than rural residents to accept counseling (Rao-Scott χ^2 test, *p* < 0.001). There was no difference between urban and rural residents in regard to the proportion willing to be tested for HIV. For urban and rural residents combined, the control county had a significantly higher proportion of participants who would accept counseling and testing (Rao-Scott χ^2 test, all *p* values less than 0.01). Willingness to accept counseling and testing was related to higher education levels (*p* values less than 0.001).

Thirty-five (7.0%; 95% CI 2.5–11.5%) participants in the CC county and 158 (30.7%; 95% CI

11.9–41.5%) in the control county visited one of the designated VCT sites within 2 months of being interviewed, but only 12 (2.5%; 95% CI 0.7–4.2%) participants in the CC county and 30 (5.6; 95% CI 1.4–9.9%) in the control county were actually tested. Design effects were 6.77 and 2.88, respectively. No testees were HIV-positive. Intention to be tested in the total sample was related to visiting a VCT site (*p* = 0.010) and being tested (*p* = 0.013). Twenty-seven of 459 (5.9%) who stated an intent to be tested were actually tested, and 15 of 548 (2.7%) who did not intend to be tested were actually tested. However, stratified analysis showed that the relationships were not significant in either county. In the CC county, the *p* values were 0.423 and 0.328, respectively; in the control county, 0.537 and 0.075, respectively.

Because differences or lack thereof between the counties in intention to get tested, visiting a VCT site, and getting tested could be due to the observed differences in income, education levels, HIV knowledge, and occupation (farmer vs. nonfarmers), we looked for relationships between these variables and intention to get tested, visiting a VCT site, and getting tested. In the CC county, only intention to get tested was related to one of the variables (lower education). Visiting a VCT and getting tested were

not related to any of the variables in the CC county. In the control county, visiting a VCT was significantly related to higher education levels, and being tested to higher income. Both education levels and income were higher in the control county. Thus, the higher proportion visiting a VCT and getting tested may be explained in part by the higher education levels and income in the control county. The other variables are unlikely to explain the difference.

DISCUSSION

This is the first study measuring the effect of the China CARES program on testing behavior in areas with a relatively high prevalence of HIV. The results of the study provide an evaluation of the program in terms of promoting VCT and increasing HIV/AIDS knowledge.

In this study, we used two-stage cluster sampling to recruit subjects, and random sampling was used in both stages. This study design is a very effective way to conduct studies when information about populations may be incomplete. Although PPS sampling at the first stage, coupled with a "constant" number per cluster at the second stage, results in a self-weighted sample in which all persons in the population have the same probability of being selected, probability weighting was still used in analysis to account for small fluctuations of numbers of participants in each cluster (ranging from 18 to 23).

Information on sensitive questions was obtained by the CD player method, which has been reported to be very efficient for collecting sensitive information.¹⁵ We found that the majority of participants were comfortable with it. HIV/AIDS knowledge levels were generally low among all participants in our study. Knowledge level was significantly related to education level (Kruskal-Wallis test, $p < 0.001$). Although education levels of urban and rural residents combined in the CC county were lower, HIV/AIDS knowledge levels of urban residents in the CC county were higher than those of urban residents in the control county, suggesting that the China CARES program may have had a positive effect upon urban residents of the CC county. This was also reflected

by the fact that more participants in the CC county claimed that they had ever participated in AIDS-related activities, had ever heard of the China CARES program, and/or knew about Chinese government policies regarding HIV. On the other hand, HIV/AIDS knowledge levels of rural residents in the CC county were lower than among rural residents in the control county. Possible reasons may include low general education levels and that the China CARES program is not reaching many of the rural areas, suggesting that the coverage of the program needs to be expanded.

Multivariate analysis showed that negative attitudes about HIV/AIDS were related to low education levels (OR $\text{£}^{1/2}$ 2.36, $p = 0.003$) and low HIV/AIDS knowledge levels (OR $\text{£}^{1/2}$ 4.77, $p < 0.001$), and differed only between rural residents in the two counties. Levels of VCT knowledge were also low among participants. More than one-third of participants did not know where to ask questions about AIDS and where to be tested for HIV. There were many questions to which participants responded that they did not know; rural residents and participants with lower education levels were more likely to answer "do not know" than their urban counterparts. Residents in the control county had higher VCT-related knowledge levels, and the differences were more significant among rural participants.

Acceptance of VCT was lower among participants in the CC county than those in the control county, although the difference was not significant for being tested. Comparison of factors associated with testing in both counties suggested that the China CARES program was not able to overcome the influence of the differences in education and income levels between the two counties. Only a few persons in each county were tested. Without testing, the China CARES program will not be able to treat all those in need. Thus, much more effort must be put into promoting testing if the program is to succeed. Only a small proportion of those stating the intent to undergo VCT actually did so, suggesting that intent may not predict action.

Multivariate analysis indicated that a negative attitude toward HIV/AIDS was the defining factor for not wanting to be tested (OR =

3.97, $p < 0.001$), and low levels of HIV/AIDS knowledge was the defining factor for not suggesting testing of pregnant women (OR = 264, $p = 0.001$). Further analysis showed that the defining factors were only applicable for urban residents. Among rural residents, lower average family income was the defining factor for not wanting to be tested (OR = 2.28, $p = 0.034$), and negative attitudes were the defining factor for not suggesting testing of pregnant women (OR = 8.88, $p = 0.048$). These results underscore the need to address stigma and low knowledge levels, especially in the rural poor, if the China CARES program is to succeed.

Compared to other similar studies in China, participants in our study had lower levels of HIV/AIDS knowledge and higher levels of high-risk behaviors than university students in northwestern China.¹⁶ A smaller proportion of participants in our study were willing to be tested for HIV than those university students. Different education levels might be the reason for these differences. Not surprisingly, participants in our study had lower levels of high-risk behaviors than migrants visiting STD clinics, including those diagnosed with STDs.¹⁷

Selection bias was a limitation in our study. Nonparticipation and nonresponse might have jeopardized the validity of our study, although we tried to minimize nonparticipation and nonresponse as much as possible. Moreover, such a response bias was difficult to assess. The refusal rate was low (1.2%), and did not differ between the two areas, but the proportion "not at home" was high. In addition, there were significant differences in distributions of gender, family income, and education levels between the two counties. Although we conducted stratified analysis, these differences reduced our power to conclude that the China CARES program is the reason for the observed results.

Because this was a cross-sectional study, we cannot define the temporal relationship between being designated a China CARES county and HIV/AIDS-related knowledge, attitudes, and practices.

There was also a possibility of information bias. Our questionnaire might not reflect all aspects of people's attitudes and perceptions of HIV/AIDS and VCT, or participants might

have misunderstood questions. Participants might not have provided accurate information on certain sensitive issues such as drug use and sexual behaviors. Some questions required recalling something that happened in the past, which is subject to "recall bias." Some measures taken to reduce information bias were using local health providers and well-trained interviewers, asking few questions that required recall, and using a CD player to administer sensitive questions. A differential bias between counties was unlikely, because the methods were similar in the two counties. Any nondifferential bias would increase the likelihood of observing no difference between counties.

Given the results presented in this study, we recommend (1) conducting information campaigns requiring only low literacy levels to increase HIV/AIDS knowledge in rural areas, where the majority of HIV-infected Chinese live; (2) promoting strategies to reduce stigma and increase understanding of and sympathy for HIV-infected persons; (3) making HIV counseling and testing a routine part of health services, especially in areas where many high-risk individuals reside; and (4) assuring that the public is aware that they will be treated if found to be HIV-infected.

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