Original Paper

HIV-Related Stigma and Associated Factors Among Rural Older Men in Sichuan Province, China: Cross-Sectional Study

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Abstract

Background: The increasing burden of HIV among older adults in China underscores the importance of understanding HIV-related stigma in aging populations. Rural older men may be particularly affected because of limited HIV-related knowledge and educational exposure. However, evidence regarding HIV-related stigma and its associated factors in this population remains limited.

Objective: This study aimed to assess HIV-related stigma among rural older men in Sichuan Province, China, and examine its associations with HIV-related knowledge, educational attainment, economic conditions, and previous exposure to HIV-related education.

Methods: A cross-sectional study was conducted in Sichuan Province from October 2024 to June 2025. A multistage sampling approach combining random selection of geographic units with convenience recruitment of individual participants at the final stage was used. A total of 526 rural men aged 50 years or older were included in the final analysis. Data were collected through face-to-face administration of structured questionnaires assessing sociodemographic characteristics, HIV-related training, HIV-related knowledge, and HIV-related stigma. Pearson correlation analysis and multivariable logistic regression were used to examine factors associated with HIV-related stigma.

Results: Only 13.3% (70/526) of participants met the criterion for adequate HIV-related knowledge. The mean overall HIV-related stigma score was 3.25 (SD 0.53), with fear of infection being the highest-scoring dimension. HIV-related knowledge scores were negatively correlated with overall HIV-related stigma scores (r=–0.323; P<.001). In multivariable logistic regression, an educational attainment of primary education or below (adjusted odds ratio [aOR] 1.743, 95% CI 1.052-2.888), a monthly income less than 1000 CNY (1 CNY=US $0.15, as of November 9, 2026; aOR 2.936, 95% CI 1.005-8.581), no participation in HIV-related training (aOR 5.267, 95% CI 2.649-10.475), and inadequate HIV-related knowledge (aOR 2.796, 95% CI 1.567-4.990) were independently associated with higher HIV-related stigma.

Conclusions: Rural older men in Sichuan demonstrated low HIV-related knowledge and substantial HIV-related stigma, particularly fear of infection. Lower educational attainment, lower income, lack of HIV-related training, and inadequate HIV-related knowledge were independently associated with higher stigma. These findings support the need for accessible and culturally appropriate interventions that correct misconceptions about HIV transmission, address fear and social distance toward people living with HIV, and provide up-to-date information on HIV treatment, particularly for rural older men with fewer educational and economic resources.

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KEYWORDS

HIV; HIV-related stigma; rural older men; HIV-related knowledge; HIV-related education; cross-sectional study

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Introduction

HIV infection remains a major global public health challenge [1]. Although China has maintained a relatively low HIV prevalence at the national level, the epidemic has undergone substantial demographic changes, with an increasing burden among older adults. National surveillance data from the Chinese HIV/AIDS Comprehensive Response Information Management System showed that the number of newly reported HIV/AIDS cases among individuals aged ≥50 years increased from 11,751 in 2010 to 51,856 in 2022. In 2022, a total of 73.34% of newly reported cases in this age group were among men, and heterosexual transmission accounted for 90.16% of cases [2]. These epidemiological characteristics highlight the increasing importance of older adults, particularly older men, in HIV prevention [3].

Sichuan Province represents a particularly relevant setting because of its substantial HIV burden and aging case profile. The number of people living with HIV in Sichuan increased from approximately 130,000 in 2018 to 170,000 in 2020 [4]. Among newly diagnosed HIV cases reported between 2018 and 2020, 74.48% were male, 53.29% were aged >55 years, and heterosexual contact accounted for 92.75% of reported transmissions [4]. Provincial surveillance also documented 18,197 HIV/AIDS cases among individuals aged ≥50 years between 2011 and 2015 [5]. Moreover, the epidemic is geographically heterogeneous, with clusters of recent infections identified in several areas, including Chengdu, Yibin, and Luzhou [4], while Liangshan Yi Autonomous Prefecture has long experienced a substantial HIV burden [6]. Together, these characteristics make Sichuan an informative setting for investigating HIV-related stigma among rural older men.

Rural older men may face particular challenges in obtaining accurate and up-to-date HIV-related information because of limited educational opportunities and inadequate exposure to targeted HIV education [7]. Such information gaps may contribute to misconceptions regarding HIV transmission, particularly exaggerated perceptions of the risks associated with everyday contact [8]. These misconceptions are important because they may contribute to fear, social avoidance, and HIV-related stigma toward people living with HIV. Recent evidence from Sichuan has demonstrated a low-knowledge–high-stigma pattern among older men and an inverse association between HIV/AIDS knowledge and HIV-related stigma, further highlighting the importance of understanding the mechanisms and contextual factors associated with stigma in this population [9].

HIV-related stigma can undermine HIV prevention by discouraging engagement with information, testing, and care [10]. The HIV stigma framework distinguishes stereotypes (group-based beliefs), prejudice (negative feelings), and discrimination (unfair treatment) directed toward people living with HIV from the stigma experienced or anticipated by people living with HIV [11]. We use these stereotypes-prejudice-discrimination (SPD) mechanisms as an interpretive framework for community attitudes toward people living with HIV, rather than as an established sequential causal model. This distinction is relevant to prevention because negative community attitudes may contribute to fears of being judged when seeking HIV-related services, including before a person knows their HIV status [10].

Within this framework, misconceptions about casual transmission may support stereotypes that people living with HIV are dangerous in everyday interactions and may be accompanied by fear and avoidance [8,11,12]. Educational attainment and economic resources may shape access to understandable information, while organized HIV education may provide opportunities to question misconceptions [7]. We therefore hypothesized that greater HIV-related knowledge, higher educational attainment, better economic conditions, and previous HIV-related education would be associated with lower stigma. The study examines these associations; it does not test mediation among the SPD mechanisms or their effects on service use.

Although HIV-related stigma has been extensively investigated in various populations, relatively few studies have specifically examined HIV-related stigma among rural older men in China [7,13]. Recent research among older men in Sichuan has demonstrated associations between HIV/AIDS knowledge, socioeconomic characteristics, sociocultural factors, and stigma [9]. However, further evidence is needed to understand HIV-related stigma specifically among rural older men, particularly the joint associations of HIV-related knowledge, educational exposure, and socioeconomic characteristics with stigma within an explicit stigma framework.

Therefore, guided by the SPD framework, this study aimed to assess the level of HIV-related stigma among rural older men in Sichuan Province and examine its associations with HIV-related knowledge, educational attainment, economic conditions, and previous exposure to HIV-related education, thereby providing evidence to inform targeted HIV education and stigma reduction interventions for this population.

Methods

Study Design and Participants

A cross-sectional study was conducted in Sichuan Province, China, from October 2024 to June 2025. A multistage sampling approach combining random selection of geographic units with convenience recruitment of individual participants at the final stage was used. First, 1 county (or district) was randomly selected from each of the 4 prefectures or cities in Sichuan Province with relatively high HIV/AIDS prevalence: Liangshan Yi Autonomous Prefecture, Chengdu, Yibin, and Luzhou. In each selected county (or district), 2 townships (or subdistricts) were randomly selected, followed by 1 village (or community) from each selected township (or subdistrict). Finally, 1 villager group was randomly selected from each selected village (or community) as the primary recruitment site.

At each selected villager group, eligible participants were recruited through community-based recruitment procedures. Before participant recruitment, the research team contacted local village committees (or community administrative offices) to introduce the study objectives and obtain assistance in

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identifying potentially eligible rural older men. Village or community staff helped disseminate information about the study and invited eligible residents to participate. Trained investigators then conducted face-to-face screening of potential participants at designated community locations (such as village committee offices or community activity rooms) or during scheduled household visits. Individuals who met the eligibility criteria and provided written informed consent were enrolled in the study.

Participants were eligible if they (1) had rural household registration, (2) were aged ≥50 years, and (3) voluntarily agreed to participate and provided written informed consent. Participants were excluded if they (1) had severe cognitive impairment or dementia that could compromise their ability to understand the survey questions, (2) had mental or consciousness disorders that could interfere with survey participation, (3) were unable to communicate effectively in Mandarin or the local dialect, or (4) were temporary residents or had resided in the study area for less than 6 months.

Older men were specifically selected because they account for the majority of newly reported HIV/AIDS cases among older adults in China and Sichuan, with heterosexual transmission predominating in this population, and represent an important population for HIV-related stigma research. Occupational status was categorized according to participants' current primary activity. Participants who were engaged in agricultural activities or were not formally employed were classified into the same category due to the characteristics of the rural older male population and the limited sample size.

Because individual participants were recruited through convenience sampling at the final stage, individual selection probabilities required for population-based survey weighting could not be reliably estimated. Accordingly, the analyses were conducted on the observed study sample rather than being presented as weighted population estimates.

Reporting Guideline

This cross-sectional study is reported in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) statement.

Measures

General Information Questionnaire

On the basis of a literature review and expert input, the research team developed a general information questionnaire that collected demographic and socioeconomic characteristics, including age, ethnicity, occupation, marital status, educational attainment, and monthly income.

Participation in HIV-Related Training

Participation in HIV-related training was assessed using a self-reported yes or no question: "Have you ever participated in any HIV-related training or educational activities?" HIV-related training was defined as organized HIV/AIDS health education sessions or awareness activities conducted in the community, including those delivered by local Centers for Disease Control and Prevention (CDC), township hospitals, village clinics, or community health workers. These activities typically covered HIV transmission routes, prevention methods, treatment availability, and misconceptions related to casual contact. Informal exposure to HIV-related information through mass media, personal communication, or other nonorganized sources was not considered HIV-related training.

HIV-Related Knowledge Questionnaire

HIV-related knowledge was assessed using 8 core HIV/AIDS knowledge questions commonly used by the Chinese HIV/AIDS Prevention and Control Committee [14]. Each correct answer was assigned 1 point, yielding a total score ranging from 0 to 8, with higher scores indicating greater HIV-related knowledge. Adequate HIV-related knowledge was defined as correctly answering at least 6 of the 8 items. The proportion of participants meeting this criterion was calculated as the HIV-related knowledge awareness rate. In the present study, Cronbach α was 0.875.

Zelaya HIV/AIDS Stigma Scale

HIV-related stigma was assessed using the Chinese HIV Stigma Scale (C-HSS) [15], which was adapted from the original scale developed by Zelaya et al [16]. The scale comprises 24 items across 4 dimensions: fear of infection, stigma bias, personal discriminatory behavior, and social discriminatory behavior, with 6 items in each dimension. Responses are rated on a 5-point Likert scale. Of the 24 items, 18 are positively keyed and 6 are reverse-keyed; reverse-keyed items were recoded before score calculation. Dimension scores were calculated as the mean of the 6 corresponding items, and the overall stigma score was calculated as the mean of all 24 items, yielding scores ranging from 1 to 5. Higher scores indicate higher levels of HIV-related stigma. According to the previously established scoring criterion, an overall score of <3 was categorized as general HIV-related stigma (coded 0), whereas a score ≥3 was categorized as higher HIV-related stigma (coded 1) [17].

The Chinese version has demonstrated satisfactory psychometric properties. In the original Chinese validation study, exploratory factor analysis identified 4 factors consistent with the hypothesized dimensional structure, accounting for 58.99% of the total variance; the scale also demonstrated satisfactory content, convergent, and discriminant validity. The overall Cronbach α was 0.905, with coefficients ranging from 0.794 to 0.869 across the 4 dimensions [15]. Subsequent validation in a Chinese migrant population further supported the 4-domain structure using confirmatory factor analysis (comparative fit index=0.915, Tucker-Lewis index=0.901, standardized root mean square residual=0.053, root mean square error of approximation=0.042) and demonstrated satisfactory construct validity for both the overall and dimension-specific scores [18]. In the present study, Cronbach α for the overall scale was 0.825.

Handling of Missing Responses

In the present study, missing responses were handled according to the following prespecified rules. For the 8-item HIV-related knowledge questionnaire, when 1 item was missing, the missing item was imputed using the participant-specific mean of the 7 completed items. Participants with 2 or more missing items were excluded. For the C-HSS, missing responses were handled separately within each 6-item dimension. When 1 item was

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missing within a dimension, the missing item was imputed using the participant-specific mean of the 5 completed items in that dimension. Participants with 2 or more missing items within any dimension were excluded. Following reverse coding and, where applicable, imputation, dimension scores were calculated as the mean of the 6 corresponding item scores, and the overall stigma score was calculated as the mean of all 24 item scores.

Ethical Considerations

All study procedures were conducted in accordance with the Declaration of Helsinki. The study protocol was approved by the ethics committee of the Affiliated Hospital of Southwest Medical University (KY2021071). Written informed consent was obtained from all participants before participation. The consent form provided information regarding the study objectives, procedures, potential risks and benefits, and participants' right to withdraw at any time without penalty. For participants with limited literacy, the consent form was read aloud in the presence of an impartial witness, and their agreement was documented by signature or thumbprint. Questionnaire responses and contact details collected for callback verification were retained by the researchers. Access to these records was restricted to the researchers conducting the study. No personally identifying information is reported in the manuscript, and study findings are presented in aggregate form. Participants received a small gift as a token of appreciation for their participation.

Data Collection

Face-to-face questionnaire interviews were conducted among rural older men in Sichuan Province from October 2024 to June 2025. A presurvey involving 15 participants informed questionnaire refinement. Quality control measures included verification questions, completeness checks, a minimum completion time of 15 minutes, and unique participant identifiers. Trained interviewers conducted interviews lasting 20 to 30 minutes in private settings, using large print questionnaires and providing assistance as needed. Daily reviews and random callback verification of 10% of participants were conducted to ensure data quality. A total of 550 questionnaires were collected. After application of the prespecified missing response criteria, 24 questionnaires were excluded, leaving 526 valid questionnaires for the final analysis, corresponding to a validity rate of 95.6%.

Statistical Analysis

After questionnaire collection, data were entered using EpiData 3.1 (The EpiData Association) and analyzed using SPSS (version 21.0; IBM Corp). Continuous variables were assessed for normality and are presented as mean (SD) when approximately normally distributed. Categorical variables are presented as frequencies and percentages. Differences in categorical variables between groups were assessed using the chi-square test. The overall HIV-related stigma score and the 4 dimension scores were approximately normally distributed and met the assumption of homogeneity of variance. Differences in mean HIV-related stigma scores between 2 groups were examined using independent-samples *t* tests, whereas comparisons across 3 or more groups were performed using 1-way ANOVA. For these comparisons, the corresponding *t* or *F* statistics and *P* values were reported. Pearson correlation analysis was used to examine the association between HIV-related knowledge scores and HIV-related stigma scores, with the Pearson correlation coefficient (*r*) and the corresponding *P* value reported. For the multivariable analysis, the overall HIV-related stigma score was dichotomized as general HIV-related stigma (a score of <3, coded 0) and higher HIV-related stigma (a score of ≥3, coded 1). Variables showing statistically significant differences in HIV-related stigma scores in the univariable group comparisons ($P<.05$) were entered simultaneously into a multivariable binary logistic regression model to examine their independent associations with higher HIV-related stigma. Adjusted odds ratios (aORs) with 95% CIs and *P* values were reported. The reference category for each categorical predictor was specified in the regression analysis and is presented in the corresponding table. All statistical tests were 2-sided, and $P<.05$ was considered statistically significant.

Results

Participant Characteristics

A total of 550 questionnaires were distributed. After application of the prespecified missing response criteria, 24 questionnaires were excluded, leaving 526 valid questionnaires for the final analysis, corresponding to a validity rate of 95.6%. For the HIV-related knowledge questionnaire, 4 participants had 1 missing item and were retained after participant-specific mean imputation, whereas 8 participants with 2 or more missing items were excluded. For the C-HSS, 10 participants had 1 missing item within a dimension and were retained after participant-specific mean imputation, whereas 16 participants with 2 or more missing items within at least 1 dimension were excluded. Thus, all 526 participants included in the final analysis had valid knowledge and C-HSS scores after application of the prespecified missing response rules.

Among the 526 participants, 208 (39.5%) were aged 50 to 60 years, 162 (30.8%) were aged 61 to 70 years, and 156 (29.7%) were aged ≥71 years. The majority were Han Chinese (516, 98.1%) and married or cohabiting (441, 83.8%). Most participants had limited socioeconomic resources: 402 (76.4%) had primary education or below, 451 (85.7%) were engaged in agriculture or were not formally employed, and 291 (55.3%) reported a monthly income of <1000 CNY (1 CNY=US $0.15, as of November 9, 2026). In addition, only 54 participants (10.3%) reported previous participation in organized HIV-related training or educational activities.

HIV-Related Knowledge Among Rural Older Men

The overall HIV-related knowledge awareness rate among rural older men in Sichuan Province was only 13.3% (70/526), indicating substantial knowledge gaps in this population. Among the 8 knowledge items, participants demonstrated relatively high awareness regarding established HIV transmission routes. Specifically, 81% (426/526) correctly identified blood exposure as a possible route of HIV transmission. However, misconceptions regarding casual contact remained highly prevalent. Only 18.4% (97/526) correctly rejected mosquito bites as a transmission route, and awareness regarding other

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nontransmisison-related behaviors was also limited. These findings indicate that while participants recognized certain established transmission routes, substantial misunderstanding persisted regarding everyday contact and infection risk (Table 1).

Table 1. HIV-related knowledge among rural older men in Sichuan Province (N=526)[a].

HIV knowledge items	Correct responses, n (%)
Is it possible to get HIV by sharing syringes with a person living with HIV?	212 (40.3)
Is it possible to tell whether a person is infected with HIV by their appearance?	190 (36.1)
Can having sex with only 1 partner reduce the risk of HIV transmission?	197 (37.5)
Can correct condom use reduce the risk of HIV transmission?	247 (47)
Can mosquito bites transmit HIV?	97 (18.4)
Can a person acquire HIV by eating with someone living with HIV?	174 (33.1)
Can a child born to a woman living with HIV acquire HIV?	289 (54.9)
Can a person acquire HIV through a transfusion of HIV-infected blood?	426 (81)

[a]A total of 70 (13.3%) participants demonstrated adequate HIV knowledge.

HIV-Related Stigma and Associated Factors

The mean total stigma score among rural older men in Sichuan Province was 3.25 (SD 0.53), indicating a moderate-to-high level of HIV-related stigma. Among the 4 stigma dimensions, fear of infection had the highest score, suggesting that concerns regarding HIV transmission were the most prominent component of HIV-related stigma. Significant differences in stigma scores were observed according to age, educational attainment, occupation, monthly income, participation in HIV-related training, and HIV-related knowledge (P<.05). Furthermore, HIV-related knowledge scores were negatively correlated with total HIV-related stigma scores (r=–0.323; P<.001), indicating that higher levels of HIV-related knowledge were associated with lower levels of HIV-related stigma. Scores for each dimension of HIV-related stigma are presented in Table 2.

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Table 2. Comparison of HIV-related stigma scores according to participant characteristics among rural older men in Sichuan Province[a].

Characteristics	Fear of infection score	Shameful prejudice score	Individual discriminatory behavior score	Social stigma behavior score	HIV stigma scale
Age					
Age groups (y), mean (SD)					
50-60	3.63 (0.83)	3.07 (0.91)	2.70 (0.66)	3.10 (0.81)	3.13 (0.52)
60-70	3.79 (0.7)	3.29 (0.70)	2.95 (0.73)	3.26 (0.66)	3.32 (0.43)
>70	4.25 (1.01)	3.01 (0.71)	3.15 (0.88)	2.93 (0.70)	3.33 (0.60)
F value	24.225	5.577	16.411	8.337	9.634
P value	<.001	.004	<.001	<.001	<.001
Education					
Educational level, mean (SD)					
Middle school level or above	3.40 (0.73)	2.96 (0.86)	2.65 (0.6)	3.01 (0.74)	3.01 (0.48)
Primary school or below	4.01 (0.89)	3.17 (0.77)	2.99 (0.78)	3.12 (0.74)	3.32 (0.49)
t test	6.965	2.577	4.384	1.419	6.034
P value	<.001	.01	<.001	.16	<.001
Occupation					
Occupation type, mean (SD)					
Salaried or self-employed	3.41 (1.07)	3.04 (1.02)	2.63 (0.65)	3.16 (0.75)	3.06 (0.49)
Agriculture or not formally employed	3.94 (0.84)	3.13 (0.76)	2.96 (0.78)	3.09 (0.74)	3.28 (0.53)
t test	–4.835	–0.926	–3.424	0.779	–3.336
P value	<.001	.36	.001	.44	.001
Marital status					
Marital status, mean (SD)					
Married or cohabiting	3.85 (0.91)	3.13 (0.79)	2.91 (0.77)	3.10 (0.71)	3.24 (0.51)
Unmarried, divorced, or widowed	3.96 (0.77)	3.06 (0.86)	2.94 (0.77)	3.09 (0.89)	3.26 (0.61)
t test	1.134	–0.784	0.288	–0.026	0.277
P value	.26	.43	.77	.98	.78
Monthly income					
Monthly income group (CNY[b]), mean (SD)					
<1000	4.16 (0.76)	3.21 (0.72)	3.03 (0.79)	3.13 (0.70)	3.38 (0.48)
1000-3000	3.54 (0.91)	3.04 (0.89)	2.81 (0.74)	2.81 (0.74)	3.11 (0.55)
>3000	3.14 (0.81)	2.76 (0.75)	2.54 (0.55)	3.01 (0.77)	2.86 (0.42)
F value	45.434	5.867	8.745	0.633	25.605
P value	<.001	.003	<.001	.53	<.001
Living conditions					
Living arrangement, mean (SD)					
Living alone	3.91 (0.87)	3.13 (0.78)	2.59 (0.63)	3.20 (0.91)	3.21 (0.48)
Living with a spouse	3.90 (0.93)	3.05 (0.81)	3.00 (0.82)	3.04 (0.70)	3.24 (0.57)
Living with children	3.78 (0.79)	3.28 (0.76)	2.79 (0.66)	3.20 (0.77)	3.26 (0.45)
F value	1.021	4.568	7.383	2.976	0.167
P value	.36	.01	.001	.05	.85
Experiences of seeking sexual partners through various methods					

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Characteristics	Fear of infection score	Shameful prejudice score	Individual discriminatory behavior score	Social stigma behavior score	HIV stigma scale
Experience, mean (SD)					
Yes	3.75 (0.66)	3.23 (0.91)	2.80 (0.67)	3.36 (0.60)	3.29 (0.51)
No	3.88 (0.92)	3.10 (0.78)	2.93 (0.78)	3.06 (0.75)	3.24 (0.53)
t test	–1.077	1.176	–1.188	3.009	0.603
P value	.28	.24	.24	.003	.55
AIDS training					
Training participation, mean (SD)					
Participated	3.28 (0.89)	2.71 (0.70)	2.47 (0.60)	2.71 (0.54)	2.79 (0.40)
Did not participate	3.93 (0.87)	3.17 (0.90)	2.96 (0.77)	3.14 (0.75)	3.30 (0.52)
t test	–5.235	–4.061	–4.510	–4.133	–6.998
P value	<.001	<.001	<.001	<.001	<.001
Knowledge about AIDS					
Self-reported knowledge, mean (SD)					
Yes	3.13 (0.81)	2.92 (0.90)	2.40 (0.59)	2.80 (0.70)	2.81 (0.52)
No	3.98 (0.85)	3.15 (0.78)	2.99 (0.77)	3.14 (0.74)	3.12 (0.50)
t test	–7.809	–2.259	0.288	–3.628	–7.815
P value	<.001	.02	.77	<.001	<.001

[a]*t* values were obtained from independent-samples *t* tests for comparisons between 2 groups, whereas *F* values were obtained from 1-way ANOVA for comparisons among ≥3 groups.

[b]1 CNY=US $0.15, as of November 9, 2026.

Factors Associated With Higher HIV-Related Stigma

To identify factors associated with higher HIV-related stigma, participants were categorized according to stigma scores (a score of <3: general HIV-related stigma; ≥3: higher HIV-related stigma). Variables associated with stigma in univariable analyses were entered into a multivariable logistic regression model. After adjustment for potential confounders, lower educational attainment, lower monthly income, lack of participation in HIV-related training, and insufficient HIV-related knowledge remained independently associated with higher HIV-related stigma. Specifically, participants with primary education or below had higher odds of having a stigma score ≥3 (aOR 1.743, 95% CI 1.052-2.888). Participants with a monthly income of <1000 CNY were also had higher odds of having a stigma score ≥3 (aOR 2.936, 95% CI 1.005-8.581). Notably, lack of HIV-related training showed the strongest association with higher HIV-related stigma (aOR 5.267, 95% CI 2.649-10.475). In addition, participants without adequate HIV-related knowledge had significantly higher odds of having a stigma score ≥3 (aOR 2.796, 95% CI 1.567-4.990). Detailed results are presented in Table 3.

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Table 3. Multivariable logistic regression analysis of factors associated with higher HIV-related stigma among rural older men in Sichuan Province.

Items and groups	β	SE	Wald statistics	*P* value	aOR (95% CI)
Education					
Primary school or below	0.556	0.258	4.655	.03	1.743 (1.052-2.888)
Middle school level or above	__[a]	—	—	—	—
Age (y)					
50-60	0.297	0.246	1.462	.23	1.346 (0.831-2.180)
60-70	0.342	0.268	1.621	.20	1.407 (0.832-2.380)
>70	—	—	—	—	—
Occupation					
Agriculture or unemployed	0.091	0.339	0.071	.79	1.095 (0.563-2.128)
Salaried or self-employed	—	—	—	—	—
Monthly income (CNY[b])					
<1000	1.077	0.547	3.874	.049	2.936 (1.005-8.581)
1000-3000	0.673	0.502	1.799	.18	1.960 (0.733-5.240)
>3000	—	—	—	—	—
AIDS training					
Did not participate	1.661	0.351	22.438	<.001	5.267 (2.649-10.475)
Participated	—	—	—	—	—
Knowledge about AIDS					
No	1.028	0.295	12.112	.001	2.796 (1.567-4.990)
Yes	—	—	—	—	—

[a]Reference category.

[b]1 CNY=US $0.15, as of November 9, 2026.

Discussion

Principal Findings

This study assessed HIV-related stigma and its associations with HIV-related knowledge, educational attainment, economic conditions, and previous HIV-related education among 526 rural men aged ≥50 years in Sichuan Province. Only 13.3% (70/526) met the criterion for adequate HIV-related knowledge. The mean overall stigma score was 3.25 (SD 0.53), with fear of infection being the highest-scoring dimension. Greater HIV-related knowledge was associated with lower stigma scores (r=–0.323; P<.001), while primary education or below, monthly income of <1000 CNY, no previous HIV-related training, and inadequate HIV-related knowledge were independently associated with higher stigma in the multivariable model. These findings address the study objectives by identifying coexisting knowledge gaps and fear of infection, together with educational and socioeconomic correlates of stigma. They primarily concern community attitudes toward people living with HIV rather than internalized stigma or experiences of discrimination reported by people living with HIV.

Interpretation and Comparison With Previous Studies

The association between knowledge and stigma is consistent with research among rural older men and older men in Sichuan [7,9]. Other Chinese studies provide complementary contexts: community surveys in Luzhou and Sichuan [19,20], surveillance among men aged ≥60 years in Chongqing [21], research involving a rural middle-aged and older population in Guangxi [22], and research involving older people living with HIV in Yunnan [23]. These differences in recruitment setting, age composition, and HIV status limit direct comparisons of knowledge awareness rates. The present study therefore adds a rural male community perspective but cannot determine whether rural residence or age explains differences between earlier samples. Item-specific misconceptions are more useful for interpreting our findings than ranking populations by their overall knowledge scores.

Interpreting the Findings Through the SPD Framework

The knowledge items help specify the cognitive component of this interpretation. Recognition of blood exposure as a transmission route was much more common than the correct rejection of mosquito bites or shared meals as transmission routes. A misconception about a transmission route is not itself a stereotype about a social group; it becomes relevant to stereotyping when generalized into a belief that people living with HIV are dangerous in ordinary social contact. The accompanying predominance of fear of infection is compatible with the affective component of the SPD framework. Avoidance

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or exclusion of people living with HIV would represent its behavioral component. Thus, avoiding a shared meal may be perceived as self-protection while imposing unjustified social exclusion on another person. This example illustrates a possible mechanism, not an observed individual-level sequence in our data [8,11,12,24].

The C-HSS fear dimension is conceptually closest to infection-related affect, whereas its discriminatory behavior dimensions capture reported discriminatory responses. These dimensions do not provide a one-to-one measurement of all SPD mechanisms: the 8-item knowledge score is not a stereotype scale, and questionnaire responses do not establish actual discriminatory behavior in everyday life. The inverse knowledge-stigma association is therefore consistent with but does not validate, the proposed interpretation. Stereotypes, prejudice, and discrimination may reinforce one another rather than occur in a fixed order. For example, avoidance may limit opportunities to challenge misconceptions through ordinary interaction. Testing such feedback would require longitudinal, mechanism-specific measures.

Fear of infection and moral judgment may sustain stigma through different mechanisms. Research in rural Chinese communities affected by former commercial plasma donation found that fear-related discrimination could persist even when infection was not attributed to socially condemned behavior [25]. This complements evidence on individual- and community-level knowledge and fear [26]: rejecting moral blame does not necessarily remove perceived danger. Conversely, research in Hong Kong links stigma to sociocultural beliefs [27], suggesting that accurate transmission knowledge may coexist with negative judgments about people living with HIV. In the SPD interpretation, information addressing infectiousness and discussion addressing blame serve related but distinct purposes. Neither should be assumed to resolve the other.

Evidence from Malaysia provides a useful contrast: relatively high transmission knowledge coexisted with stigmatizing attitudes, and knowledge was not uniformly associated with less stigma [28]. This cautions against treating factual knowledge as a sufficient explanation across settings. Research examining the cultural formation of stigma in an ethnic minority population in Southwest China offers another context for considering local meanings of HIV [29]. Its applicability requires care because our sample was predominantly Han Chinese. Rather than assuming that a cultural explanation transfers unchanged, locally adapted education should elicit participants' own beliefs about infection, responsibility, and social inclusion. Together, these comparisons explain why the observed knowledge association identifies 1 potential intervention target without exhausting the causes of stigma.

Educational Exposure and Socioeconomic Context

The association between previous organized education and stigma remained after adjustment for the knowledge category. This raises the possibility that educational encounters provide reassurance or opportunities to discuss social attitudes beyond the factual content captured by the 8 knowledge items. However, the binary training measure did not assess content, duration, quality, or timing. Men with less stigmatizing attitudes or better access to services may also have been more willing to attend education. The observed association cannot establish an intervention effect or show that training is more effective than other approaches. Previous studies support examining educational interventions, but their findings do not demonstrate effectiveness in this specific population [7,30,31].

Lower education and income may indicate constraints on access to understandable information and services, rather than individual unwillingness to learn. A systematic review also examined socioeconomic correlates of stigma, although it focused on people living with HIV and therefore addresses a different perspective from community attitudes toward people living with HIV [32]. Our adjusted associations do not demonstrate that knowledge mediates socioeconomic differences in stigma; residual confounding and information not captured by the knowledge score remain possible. The income estimate was also imprecise, with its CI approaching the null at its lower bound. These findings favor accessible delivery and evaluation across socioeconomic groups. They do not justify attributing stigma solely to poverty or low literacy.

Linking Stigma Reduction to HIV Prevention and Earlier Diagnosis

The prevention relevance lies in 2 related but distinct processes: attitudes toward people living with HIV may shape the social environment, while fear of becoming the target of those attitudes may discourage an individual from seeking HIV services. Qualitative research in China has described avoidance of HIV information and health care in response to anticipated shame and social sanctions [10]. Applied to rural older men, this suggests that requesting a test or discussing sexual risk could be interpreted as inviting judgment about sexual behavior. An older man might consequently postpone testing even when concerned about an exposure. This is a proposed extension to the study population, not an association measured here. Evidence of late diagnosis among older adults in China establishes the relevance of improving testing access but does not by itself attribute delayed diagnosis to stigma [33].

Education could support prevention through both risk understanding and reduced social barriers. Distinguishing safe everyday contact from sexual exposure can redirect attention from avoiding people living with HIV to effective protective practices, including correct condom use. Explaining that appearance cannot establish HIV status and that older age does not remove the need to consider exposure may make testing more personally relevant. This content is pertinent to the gaps in the condom- and appearance-related knowledge items in Table 1. Nonjudgmental discussion of HIV and explicit rejection of blame may additionally reduce the perceived social cost of requesting information or testing. Improved factual knowledge alone, however, will not ensure condom use or testing if confidentiality, service access, or interpersonal barriers remain unresolved.

A further pathway links diagnosis with treatment and the prevention of onward transmission. Testing can enable linkage to antiretroviral therapy (ART), and people who maintain an undetectable viral load while taking ART as prescribed do not

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transmit HIV sexually [34]. A Hong Kong survey associated limited awareness or unfavorable perceptions of U=U with higher stigma profiles [35]. However, a UK experiment found no overall advantage of 1 U=U message frame over another in reducing stigma [36]. Thus, explaining this conditional meaning of U=U may counter the belief that people living with HIV are inevitably infectious and clarify the value of diagnosis and continued care. This message concerns sexual transmission under sustained viral suppression; it should not imply that receiving an HIV diagnosis or merely starting treatment immediately removes transmission risk. Taken together, the proposed pathway is that education and a less stigmatizing environment may support prevention and testing, followed, when HIV is diagnosed, by linkage to effective treatment. Our study did not measure any change along this pathway.

Public Health Implications

A practical response would combine brief, repeated education with confidential routes to testing and care. Village clinicians and township health workers could use spoken local language explanations, large print pictures, and teach-back methods to distinguish transmission routes, discuss condom use, and explain testing procedures. Integrating this information into routine older adult health contacts could reduce the need to identify oneself publicly as seeking HIV services. Private opportunities to ask questions and clear explanations of confidentiality should accompany referral information. These delivery approaches are proposals to be adapted with local participants and evaluated, rather than interventions tested in this study.

Content should also address the affective and behavioral components of stigma. Facilitated discussion of everyday inclusion and consent-based, anonymized or recorded accounts from people living with HIV could challenge fear and blame without requiring local disclosure. Evidence from other intervention settings supports considering such components, but their transferability to rural older men needs assessment [30,37]. Prospective evaluation should measure transmission beliefs, prejudice, discriminatory responses, and anticipated judgment about service use separately, alongside actual testing uptake, linkage to care, and relevant prevention behaviors. Longer follow-up and appropriate comparison groups would be needed to assess earlier diagnosis or reduced HIV transmission. This would test whether changes in stigma translate into the prevention benefits proposed here.

Limitations

Several limitations should be considered when interpreting the findings of this study. First, the cross-sectional design precludes conclusions regarding temporal or causal relationships between HIV-related knowledge, socioeconomic characteristics, educational exposure, and HIV-related stigma. The knowledge questionnaire and C-HSS were not designed to establish a temporal sequence among stereotypes, prejudice, and discrimination, and no mediation analysis was performed. The study did not evaluate whether stigma was associated with testing uptake, time to diagnosis, condom use, ART initiation, or HIV incidence. Accordingly, the proposed prevention pathways are hypotheses informed by external evidence. HIV status was not specified as an eligibility criterion, so this community sample should not be assumed to consist entirely of people without HIV. Longitudinal and intervention studies are needed to examine these relationships.

Second, although geographic sampling units were randomly selected at several stages, individual participants within the selected villager groups were recruited through convenience sampling. Individual selection probabilities could therefore not be reliably estimated, and population-based survey weighting was not applied. Consequently, the study sample should not be considered statistically representative of all rural older men in Sichuan Province, and the findings should be generalized with caution.

Third, the study included only rural older men; therefore, the findings cannot be directly generalized to older women or other populations. Future studies should include more diverse populations to examine potential sex- and gender-related differences in HIV-related stigma. Fourth, HIV-related knowledge, training exposure, and stigma were assessed using self-reported questionnaires administered face-to-face, which may have introduced recall and social desirability biases, particularly for socially sensitive attitudes.

Finally, although the C-HSS has demonstrated satisfactory psychometric properties in Chinese populations, the cutoff used to categorize general (<3) and higher (≥3) levels of stigma was an operational analytical threshold rather than a clinically validated severity cutoff. Future studies may further evaluate the dimensional and continuous properties of HIV-related stigma and examine whether alternative scoring approaches yield consistent findings.

Conclusions

Addressing HIV-related stigma among rural older men has broader implications for equitable access to HIV information and services in aging rural communities. The findings support prioritizing accessible, age-appropriate education that addresses transmission misconceptions alongside fear, blame, and discriminatory responses, with particular attention to men with fewer educational and economic resources. Linking this education with confidential, nonjudgmental testing and care could help create a more supportive environment for HIV prevention and earlier diagnosis. The SPD framework can guide the selection of distinct cognitive, emotional, and behavioral intervention components. Prospective studies should establish whether these approaches reduce stigma and improve service use and prevention outcomes before such benefits are assumed.

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Data Availability

The manuscript presents aggregate results from this study. The participant-level dataset is not publicly available due to confidentiality restrictions on the information collected from participants. Requests for access to the study data and data collection instruments may be directed to the corresponding author. Access will be considered in accordance with the applicable consent provisions, institutional requirements, and participant confidentiality protections.

Generative AI Use

ChatGPT (version GPT-6.1 Sol; OpenAI) was used during manuscript revision to assist with English translation and editing and to improve clarity.

Authors' Contributions

Conceptualization: JC, CX, XL, JR
Data curation: JC, MH, YY
Formal analysis: JC, MH, YY
Methodology: JC, CX, XL, JR, HT
Writing – original draft: JC
Writing – review & editing: JC, CX, XL, MH, YY, DZ, HT, JR
All authors reviewed and approved the final manuscript and agree to be accountable for the work.
JC, CX, and XL contributed equally to this manuscript as co-first authors.

Conflicts of Interest

None declared.

Multimedia Appendix 1

STROBE checklist.
[PDF File (Adobe PDF File), 111 KB-Multimedia Appendix 1]

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Abbreviations

aOR: adjusted odds ratio
ART: antiretroviral therapy
C-HSS: Chinese HIV Stigma Scale
CDC: Centers for Disease Control and Prevention
SPD: stereotypes-prejudice-discrimination
STROBE: Strengthening the Reporting of Observational Studies in Epidemiology

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