Study on Influencing Factors to HIV Health Services Among MSM: Based on Andersen Behavioral Model

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Study on influencing factors to HIV health services among MSM: based on Andersen Behavioral Model

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Abstract:

Background: We assessed the utilization of HIV health services and its influencing factors on consistent condom use, HIV testing and HIV counseling among men who have sex with men (MSM), so as to provide a theoretical basis for future infectious disease prevention and control strategies and health services policy formulation.

Methods: This study is a cross-sectional study. From April 2013 to October 2014, a sample survey was conducted in southwest China including Chongqing, Sichuan, Xinjiang and Guangxi, and an anonymous self-administered questionnaire survey was conducted among MSM who met the requirements and were recruited. Based on Anderson Behavioral Model, the questionnaire divided the influencing factors into predisposing factor, enabling factor and need factor. There were 1727 valid questionnaires. SAS 9.4 was used for univariate analysis and multivariate Logistic regression analysis to explore the factors influencing the utilization of health services. AMOS Graphics 24.0 was used to construct the path diagram through path analysis to explore the effect among various factors.

Results: In the survey of HIV health services, 9.96% of respondents consistently used condoms, 78.00% had HIV testing, and 60.63% had HIV counseling. Among the predisposing factor, the older respondents are, the easier it is to be tested for HIV(β=0.078, $p<0.001$). Among the enabling factor, urban registration is a factor that promotes HIV testing and counseling(β=0.064,p=0.003 and β=0.072, p=0.002). Among the need factor, HIV knowledge score is also a key point affecting testing and counseling(β=0.157, $p<0.001$ and β=0.184, $p<0.001$). The diagnosis of STD can promote respondents counseling(β=0.051, p=0.031). Depression is a contributing factor to consistent condom use(β=0.051,p=0.033), but negative to HIV counseling(β=-0.119, $p<0.001$).

Conclusions: For these groups, MSM with high-risk characteristics should be identified as a priority in the future public health services. HIV knowledge should be promoted in health education, physical and mental health diagnosis and treatment should also be strengthened.

Keyword: health services, MSM, HIV, Anderson Behavioral Model, path analysis

Background

As a chronic infectious disease, AIDS has seriously affected the development of global public health undertakings. At the same time, the number of AIDS-related deaths is far higher than that of other infectious

diseases[1], which is a threat to public health and quality of life. In recent years, the AIDS epidemic in China has grown rapidly, from 440,000 in 2011 to 950,000 in 2019[2]. Among them, MSM is the main key population of HIV infection. Homosexual transmission has become the second most common HIV transmission route after heterosexual transmission, accounting for about a quarter of new HIV cases. Despite some success in HIV prevention efforts, the rate of HIV transmission among MSM population still remains high[3]. Therefore, it is very important to pay attention to the need and utilization of health services for this population.

Health services mainly refer to medical treatment, prevention, health care, rehabilitation and other activities provided to residents by the health system with certain health resources, including prevention and control of infectious diseases[4], disease screening[5] and disease surveillance[6]. Among them, HIV-related health services mainly include: HIV testing, HIV counseling, condom use and so on. As early as the beginning of the 21st century, existing countries recognized the importance of strengthening public health services to combat infectious diseases and conducted continuous research and improvement[7]. A Canadian study found that the private health services of HIV counselling and point-of-care(POC) testing based on urban communities were acceptable and feasible to a certain extent[8]. In addition, the Internet can be used as a potential point of access to health screening to address inequalities in health services, according to a US online survey[9]. And some Chinese scholars also have integrated the newly developed M-Health app with HIV health services to prevent disease transmission and reduce HIV infection rate.

In health services, the priority groups often focus on: adolescents[10], mothers and children[11], migrants[12], female sex workers[13] , etc. MSM, as a special population, has been largely ignored by health service projects [9]. In areas with laws and policies forbidden, some key population is more difficult to access them[10]. However, reasonable evaluation of acquisition and quality of health services can help reduce disparities and health care inequalities in MSM and other sexual minorities populations[9]. Future research should also give priority to a gender-specific organizational framework to understand and address the complex situation of limited MSM access to HIV health services.

Several studies have shown that social structure, psychological factors, stigma, homophobia, and policy issues can all affect MSM engagement and positivity in HIV health services[14]. There is also evidence that MSM have been rejected by family members, publicly humiliated and laughed by health care workers when they disclose their sexual orientation [15]. Because of the stigma and discrimination from health providers and neglect by health systems, it poses a significant challenge to HIV care and treatment for this population. Therefore, based on Anderson Behavioral Model and path analysis, this paper takes consistent condom use, HIV testing and HIV counseling as health services utilization items, and discusses the utilization and influencing factors of health services for MSM. Priority should be given to the identification of high-risk characteristics of this population, and intervention or further research should be conducted to improve the

utilization of HIV health services and reduce the incidence of new infections, and to provide more new ideas for future service supply strategies.

Methods

Participants and procedures

This study is a cross-sectional study. From April 2013 to October 2014, in four regions of southwest China, including Chongqing, Sichuan, Xinjiang and Guangxi, qualified subjects were first sought through advertisements on gay websites and QQ groups, and then more people were recruited through "snowball" sampling. Inclusion criteria include :(1) signing of informed consent. (2) Age≥18 years and ≤65. (3) Having sex at least once every two weeks on average. (4) Had at least one sexual partner in the previous month. The method of anonymous self-filling questionnaire was adopted, which was collected on the spot and checked for completeness and logic.

Definitions of HIV health services

HIV health services in this study include: consistent condom use, HIV testing and HIV counseling. Consistent condom use is defined as the use of condom every time including anal and oral sex. The project measured the number of times respondents had inserted sex and the number of times they used condoms during sex. HIV testing refers to whether the respondents had been tested for HIV, and they chose "yes" or "no". HIV counselling refers to whether the respondents have had AIDS-related counselling, and they choose "yes" or "no".

Andersen Behavioral Model

The Anderson Behavioral Model chosen for this study was originally developed in the 20th century to describe the factors that influence the use of health services[16]. Has been used to guide the examination of predictors associated with a variety of health outcomes, such as drug use among people living with HIV[17]. The model has been widely used in hypertension disease management[9], women's mental health[18], breast cancer screening[19, 20], etc. Taking Anderson Behavioral Model as the theoretical basis and incorporating it into the analysis of influencing factors can better explain and understand the influence of variables on outcome indicators, and can also better clarify the context of health services, so as to provide targeted suggestions for future policy making.

The model divided the influencing factors into: predisposing factor, enabling factor and need factor. Predisposing factor refers to an individual's unchangeable nature, including demographic variables and social structural variables[21]. Age, nationality, degree of education, employment and sexual role are included into this factor. Enabling factor refers to that can promote or hinder the use of services, including personal

resources and regional health services resources[21].Household registration, income, marriage, find sexual partners through the Internet and commercial sexual service are included into this factor. Need factor refers to the subjective understanding of the disease and clinical objective diagnosis results[21]. HIV knowledge score, diagnosis of sexually transmitted disease (STD), anxiety and depression are included into this factor.

HIV knowledge score

In the basic information, the HIV knowledge scale(Cronbach's alpha = 0.672) was made up of 13 questions based on a revision of the International AIDS Knowledge Survey General Scale[22]. The answers include "true", "false" and "don't know". Based on the answers, there is a 1 point for correct answers, and 0 points for incorrect or unknown answers. The higher score is, the more knowledge the respondents had about HIV.

Anxiety

Anxiety was measured by the self-rated anxiety scale[23], and related research showed that the scale had dependable reliability and validity[24](Cronbach's alpha = 0.86). The scale is composed of 20 items, and the selected score from 0 to 4 represents the frequency of personal experience of the respondents, among which 5 questions are scored in reverse. The final added score was adjusted by multiplying by 1.25, with a total score of > 50 indicating a possible clinical anxiety.

Depression

Depression was measured by the Center for Epidemiological Studies Depression Scale[25], used for epidemiological investigation to screen out patients with depression for further diagnosis(Cronbach's alpha = 0.87). The scale is composed of 20 items, and the selected score from 0 to 3 represents the frequency of personal experience of the respondents, among which 4 questions are scored in reverse. The final total score >16 indicates the possibility of clinical depression.

Statistical analysis

Firstly, descriptive analysis was conducted for each variable in the questionnaire, and then univariate analysis and multivariate Logistic regression analysis were conducted according to outcome variables: consistent condom use, HIV testing and HIV counseling. According to the results of multivariate analysis, a path diagram was constructed to explore the impact of each path. $P<0.05$ was considered statistically significant. In path analysis, the fitting index of the model is referred to: χ^2/df： 1~3, $p>0.05$, IFI>0.9, TLI>0.9, CFI>0.9, RMESEA>0.10. SAS 9.4 was used for univariate analysis and multivariate analysis, and AMOS Graphics 24.0 was used for path analysis.

Results

In this HIV health services survey, 1,914 questionnaires were collected in Chongqing, Sichuan, Xinjiang and

Guangxi. The questionnaires that did not meet the requirements were excluded: 7 questionnaires did not complete HIV testing, 8 questionnaires did not complete HIV counseling, and 103 questionnaires did not complete condom use. 30 questionnaires were incomplete HIV knowledge score scale, 25 questionnaires were incomplete depression scale and 14 questionnaires were incomplete anxiety scale. A total of 1727 valid questionnaires met the requirements, with an effective recovery rate of 90.23%.

In this health services survey, 9.96% of respondents consistently used condoms, 78.00% had HIV testing, and 60.63% had HIV counseling. The results of univariate analysis are shown in the table. (Table 1)

Among the respondents who continuously used condoms, the rate was statistically different for those who played different sexual roles (P=0.0022), and the "1" and "0" sexual roles were 13.16% and 7.14% respectively. The continuous condom use rate of unmarried people was 9.10%, that of married people 9.64%, and that of divorced people 18.71%, with statistical differences (P=0.0144). The continuous condom use rate was 11.86% in depressed people and 8.77% in non-depressed people, and the rate was higher in depressed people (P=0.0365). There was no statistical difference in other factors.

Among the respondents who had been tested for HIV, there were statistically significant differences in different ages (P<0.0001), and the rates of 18-25 years old, 25-35 years old, and ≥35 years old were 48.84%, 74.57%, and 83.23% respectively. The HIV testing rate of respondents of Han nationality was lower than that of other nationalities (P=0.0017). There were statistically significant differences with different education levels, employment status, sexual roles and income, and urban areas was higher than that in rural areas (P< 0.0001). Respondents with higher HIV knowledge score and no depression had a higher testing rate (P<0.05). Among respondents who had HIV counseling, the rates varied by age, employment, income, and sexual roles. The HIV counseling rate of Han nationality was lower than that of other nationalities (P=0.0077), and urban areas was higher than that in rural areas (P<0.0001). Respondents with high HIV knowledge score and no depression and anxiety had higher HIV counseling rate (P<0.05).

Table 1 Univariate analysis of consistent condom use, HIV testing, and HIV counseling based on Anderson Behavioral Model

Items	N (%)	Consistent condom use	HIV testing	HIV counseling
Predisposing factor				
Age		0.1275	**<.0001**	**<.0001**
18~25	43(2.49%)	5(11.63%)	21(48.84%)	20(46.51%)
25~35	873(50.55%)	76(8.71%)	651(74.57%)	485(55.56%)
≥35	811(46.96%)	91(11.22%)	675(83.23%)	542(66.83%)

Nationality		0.1825	**0.0017**	**0.0077**
Ethnic Han	1604(92.93%)	164(10.22%)	1237(77.12%)	958(59.73%)
Others	122(7.07%)	8(6.56%)	109(89.34%)	88(72.13%)
Degree of education		0.0632	**0.0009**	0.2366
Junior high and below	203(11.77%)	21(10.34%)	156(76.85%)	107(52.71%)
Senior high	469(27.19%)	61(13.01%%)	359(76.55%)	283(60.34%)
Junior college	419(24.29%)	34(8.11%%)	329(78.52%)	274(65.39%)
College and above	634(36.75%)	56(8.83%)	516(81.39%)	381(60.09%)
Employment		0.5672	**<.0001**	**0.0010**
Employed	1318(76.45%)	134(10.17%)	1064(80.73%)	829(62.90%)
Retirement	16(0.93%)	3(18.75%)	12(75.00%)	10(62.50%)
Student	248(14.39%)	19(7.66%)	161(64.92%)	127(51.21%)
Unemployed	142(8.24%)	15(10.56%)	108(76.06%)	80(56.34%)
Sexual role		**0.0022**	**0.0088**	**0.0083**
Only “1”	456(26.50%)	60(13.16%)	364(79.82%)	292(64.04%)
Both, mainly "1"	378(21.96%)	38(10.05%)	310(82.01%)	235(62.17%)
Both of it	444(25.80%)	43(9.68%)	342(77.03%)	273(61.49%)
Both, mainly "0"	261(15.17%)	17(6.51%)	202(77.39%)	150(57.47%)
Only ”0”	182(10.58%)	13(7.14%)	127(69.78%)	96(52.75%)
Enabling factor				
Household registration		0.4201	**<.0001**	**<.0001**
Urban	1237(71.79%)	128(10.35%)	1007(81.41%)	789(63.78%)
Rural	486(28.21%)	44(9.05%)	336(69.14%)	257(52.88%)
Income		0.3001	**<.0001**	**0.0002**
≤1000	290(17.00%)	27(9.31%)	194(66.90%)	156(53.79%)
1000~3000	620(36.34%)	56(9.03%)	478(77.10%)	362(58.39%)
3000~5000	585(34.29%)	63(10.77%)	480(82.05%)	380(64.96%)
>5000	211(12.36%)	23(10.90%)	180(85.31%)	140(66.35%)
Marriage		**0.0144**	0.1520	0.8829
Unmarried	1307(75.68%)	119(9.10%)	1031(78.88%)	792(60.60%)
Married	280(16.21%)	27(9.64%)	207(73.93%)	166(59.29%)
Divorced	139(8.05%)	26(18.71%)	108(77.70%)	89(64.03%)

Find sexual partners through the Internet		0.3217	0.2352	0.2386
Frequently	114(6.86%)	11(9.65%)	88(77.19%)	66(57.89%)
Sometimes	286(17.20%)	29(10.14%)	238(83.22%)	189(66.08%)
Occasionally	656(39.45%)	56(8.54%)	496(75.61%)	391(59.60%)
None	607(36.50%)	69(11.37%)	468(77.10%)	359(59.14%)
Commercial sexual service		0.0847	0.3203	0.2543
Yes	100(5.80%)	15(15.00%)	82(82.00%)	66(66.00%)
No	1623(94.20%)	157(9.67%)	1262(77.76%)	978(60.26%)
Need factor				
HIV knowledge score		0.1087	**<.0001**	**<.0001**
≥11	639(37.00%)	54(8.45%)	584(91.39%)	471(73.71%)
<11	1088(63.00%)	118(10.85%)	763(70.13%)	576(52.94%)
Diagnosis of STD		0.1875	0.1966	0.1162
Yes	136(7.89%)	18(13.24%)	112(82.35%)	91(66.91%)
No	1587(92.11%)	154(9.70%)	1231(77.57%)	953(60.05%)
Depression		**0.0365**	**0.0277**	**<.0001**
Yes	666(38.56%)	79(11.86%)	501(75.23%)	347(52.10%)
No	1061(61.44%)	93(8.77%)	846(79.74%)	700(65.78%)
Anxiety		0.2654	0.1200	**0.0015**
Yes	403(23.34%)	46(11.41%)	303(75.19%)	217(53.85%)
No	1324(76.66%)	126(9.52%)	1044(78.85%)	830(62.69%)

The results of multivariate Logistic regression analysis are shown in the table. (Table 2)

Those in sexual roles who only did "1" were 2.229 times more likely to continue using condoms than those who only did "0" (1.157 to 4.292). The probability of continuous condom use was 0.660 times (0.473 to 0.921) of the respondents without depression among the predisposing factor, that is, the more depressed the respondents were, the more likely they were to continue to use condoms.

From the age of 18 to 25, with low HIV knowledge score, the probability of HIV testing was 0.311 times (0.146 to 0.660) and 0.237 times (0.172 to 0.326), respectively, compared with the control group. It can be seen that younger age and low HIV knowledge score are factors that hinder HIV testing. Among the enabling factor, the probability of HIV testing in urban households was 1.614 times higher than in rural households (1.243 to 2.096).

The probability of HIV counseling was 1.308 times (1.041 to 1.644), 1.542 times (1.030 to 2.309) and 1.697 times (1.373 to 2.098) of the subjects with urban household registration, STD diagnosis and no depression, respectively, compared with the control group, and low HIV knowledge score was 0.452 times (0.361 to 0.565) compared with the control group, indicating that the higher the HIV knowledge score was, the more likely it was to conduct HIV counseling.

Table 2 Multivariate Logistic regression analysis of consistent condom use, HIV testing, and HIV counseling

	Consistent condom use			HIV testing			HIV counseling	
	OR (95%CI)	P-value		OR (95%CI)	P-value		OR (95%CI)	P-value
Predisposing factor			***Predisposing factor***			***Predisposing factor***		
Sexual role			**Age**			**Age**		
Only “1”	2.229(1.157 to 4.292)	**0.0011**	18~25	0.311(0.146 to 0.660)	**0.0157**	18~25	0.578(0.302 to 1.103)	0.3064
Both, mainly "1"	1.531(0.774 to 3.029)	0.5183	25~35	0.542(0.389 to 0.756)	0.8873	25~35	0.648(0.525 to 0.801)	0.3776
Both of it	1.414(0.718 to 2.784)	0.8619	≥35	Reference		≥35	Reference	
Both, mainly "0"	1.016(0.471 to 2.189)	0.1650	**Employment**			***Enabling factor***		
Only ”0”	Reference		Employed	1.235(0.794 to 1.919)	0.1601	**Household registration**		
Need factor			Retirement	1.071(0.264 to 4.339)	0.8091	Urban	1.308(1.041 to 1.644)	**0.0214**
Depression			Student	0.604(0.354 to 1.030)	0.0457	Rural	Reference	
Yes	Reference		Unemployed	Reference		***Need factor***		
No	0.660(0.473 to 0.921)	**0.0145**	***Enabling factor***			**HIV knowledge score**		
-	-	-	**Household registration**			≥11	Reference	
-	-	-	Urban	1.614(1.243 to 2.096)	**0.0003**	<11	0.452(0.361 to 0.565)	**<.0001**
-	-	-	Rural	Reference		**Diagnosis of STD**		
-	-	**-**	***Need factor***			Yes	1.542(1.030 to 2.309)	**0.0356**
-	-	**-**	**HIV knowledge score**			No	Reference	
-	-	**-**	≥11	Reference		**Depression**		
-	-	**-**	<11	0.237(0.172 to 0.326)	**<.0001**	Yes	Reference	
-	-	**-**	-	-	**-**	No	1.697(1.373 to 2.098)	**<.0001**

Based on path analysis, the fitting degree of the model is good (χ^2/df=2.960, p=0.001). Due to the large sample size (N=1727) in this study, P-value may be small, but other fitting indexes meet the requirements (Table 3), so P=0.001 is also acceptable.

From the path analysis diagram and coefficients, it can be concluded that MSM with depression is more likely to use condom during each sexual behavior, and it is a direct effect, β=0.051, P=0.033.

Respondents living in urban areas were more likely to be tested for HIV, and the direct effect accounted for 68.82%, β=0.064, P=0.003. The higher HIV knowledge score of the respondents was the factor that promoted HIV testing, among which the direct effect accounted for 68.56%, β=0.157, P<0.001. Older age was also a factor that promoted testing, and it was a direct effect. The path coefficient was 0.078, P<0.001. Respondents diagnosed with STD is more likely to be tested for HIV, which is an indirect effect, β=0.020. People with depression are less likely to be tested for HIV, which is the indirect effect, β=-0.047.

Household registration in urban, higher HIV knowledge score, diagnosed with STD are more likely to do HIV counseling, and they are all direct effect. The path coefficients were as follows: β=0.072, P=0.002; β=0.184, P<0.001; β=0.051, p=0.031. Depression was a negative factor, β=-0.119, P<0.001. In the use of health services, the more HIV counseling, the easier HIV testing, with a direct effect, β=0.391, P<0.001.

It can be seen that, among the predisposing factor, the older age is, the easier it is to be tested for HIV. Among the enabling factor, urban area is a factor that promotes HIV testing and counseling. Among the need factor, the higher HIV knowledge score and STD diagnosis were the factors that also promoted testing and counseling, while the respondents with depression were more likely to use condoms every time, but it was not easy to conduct testing and counseling. (Table 4,5) (Figure 1)

Table 3 The fitting index of the model

	χ^2/df	P	IFI	TLI	CFI	RMESEA
Fitting index	2.960	0.001	0.969	0.918	0.968	0.034
Criterion	1~3	＞0.05	＞0.90	＞0.90	＞0.90	＜0.10

Table 4 Standardized path coefficients between variables

Variables			Estimate	P value
HIV counseling	<---	STD	0.051	0.031
HIV counseling	<---	Depression	-0.119	0<.001
HIV counseling	<---	HIV knowledge score	0.184	0<.001
HIV counseling	<---	Household registration	0.072	0.002
Consistent condom use	<---	Depression	0.051	0.033
HIV testing	<---	Age	0.078	0<.001

Variables			Estimate	P value
HIV testing	<---	Household registration	0.064	0.003
HIV testing	<---	HIV knowledge score	0.157	0<.001
HIV testing	<---	HIV counseling	0.391	0<.001

Table 5 Direct effect, indirect effect and total effect among variables in the model (Standardized)

Dependent variable	Effect	Independent Variable					
		Household registration	HIV knowledge score	STD	Depression	Age	HIV counseling
Consistent condom use	Direct effect	-	-	-	0.051	-	-
	indirect effect	-	-	-	-	-	-
	total effect	-	-	-	0.051	-	-
HIV testing	Direct effect	0.064	0.157	-	-	0.078	0.391
	indirect effect	0.028	0.072	0.020	-0.047	-	-
	total effect	0.093	0.229	0.020	-0.047	0.078	0.391
HIV counseling	Direct effect	0.072	0.184	0.051	-0.119	-	-
	indirect effect	-	-	-	-	-	-
	total effect	0.072	0.184	0.051	-0.119	-	-

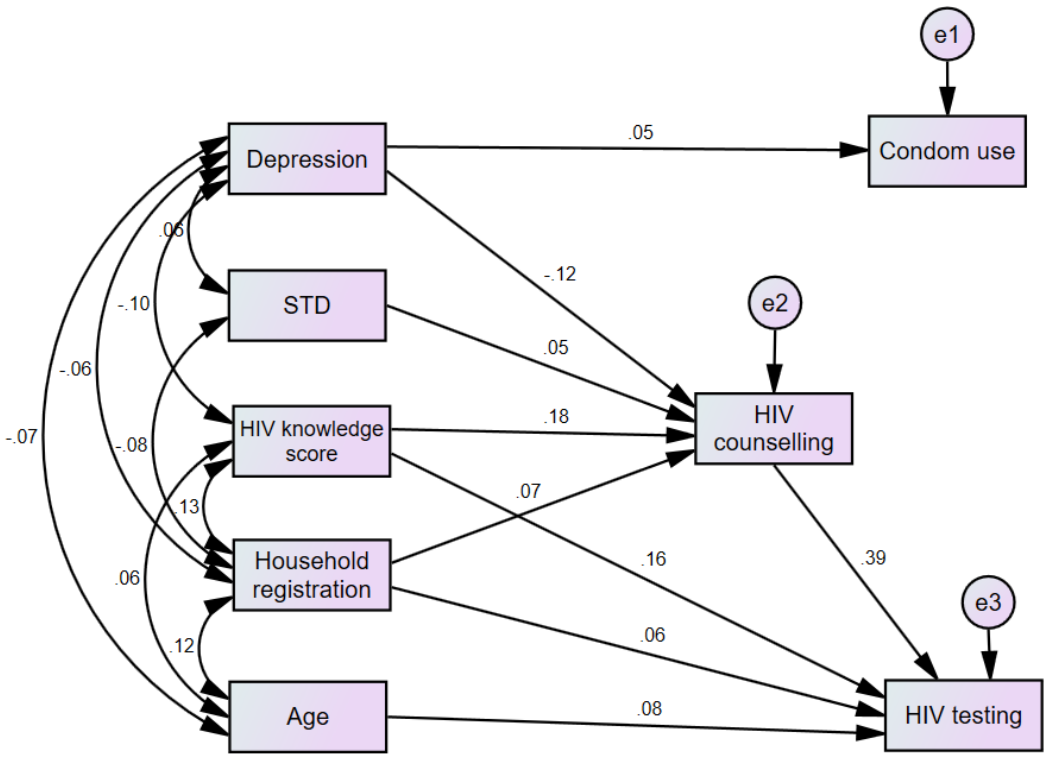

Figure 1 Path analysis diagram

Discussion

Andersen's model was adapted to identify factors associated with HIV health services by including sets of variables. The model helped uncover factors that may be ignored before, especially among MSM. Among the health services utilization projects examined in this study, the utilization of HIV counseling and HIV testing was good, but the status of consistent condom use was not optimistic, which is accordant with the description of Mengran[26]: a low level of intentions to use condoms consistently has been reported in Chinese MSM population.

According to the Anderson behavioral model, need factor reflects how people view their own health, subjective cognition of disease and clinical diagnosis for individual physical condition, is the most direct and important factor which influences health services utilization. Therefore, it is considered to be one of the powerful predictor in health services[27]. It can also be seen from this study that need factor is the main factor affecting HIV health services. Among them, HIV knowledge score, diagnosis of STD and depression of respondents had statistically significant effects.

In the 1727 valid questionnaires collected this time, the average HIV knowledge score was 9.31±2.58, among which, ≥11 accounted for 37% and <11 accounted for 63%, indicating that the degree of HIV knowledge was generally moderate. HIV knowledge is the main factor affecting HIV testing and HIV counseling, which is also consistent with the research ideas of Sofia[28]. In fact, as early as 10 years ago, scholars proposed the Information, Motivation and Behavioral Skills (IMB) Model, which has guiding significance in HIV risk reduction interventions[29]. The information in the IMB model mainly includes subjective information and objective information, of which objective information includes knowledge[30]. More and more studies have found that HIV knowledge plays a key role in the prevention and control of AIDS. The studies of Simukai and Doris[31, 32] also indicated that HIV knowledge and attitude were associated with non-condom use and high-risk sexual behavior, so knowledge promotion and popularization based on media platforms were urgently needed. At the same time, Chilot[33] has pointed out that a very low comprehensive knowledge of HIV/AIDS among women of reproductive age in Ethiopia is one of the major reasons for the increase of HIV infections. It has been confirmed in the literature that educational programs[34], sexual education and communication activities[35] can contribute to the improvement of knowledge. However, it remains to be discussed whether increased HIV knowledge will necessarily lead to improved behavior, because of the phenomenon of "knowledge-practice separation". According to the theory of Knowledge, Attitude and Practice (KAP) and the study of Min-Jin Peng[36], we can see that the phenomenon of "knowledge-practice separation" does exist, and at the same time, improving self-efficacy may help to solve this problem. Therefore, in the future, more studies are needed to evaluate the HIV knowledge of high-risk groups and explore relevant influencing factors,

so as to solve the problem of "knowledge-practice separation" or "knowledge-attitude separation" in this group for reducing the incidence of new HIV infection.

According to the results of this study, individuals who are clinically diagnosed with STD are more likely to undergo HIV testing and HIV counseling. Conversely, individuals with depression are less likely to seek counseling and testing facing to general public, but more likely to use condoms every time they have sex. Our analysis shows that the impact of STDs on MSM is also significant. With undiagnosed or untreated STDS will also increase the risk of HIV transmission[37]. It makes sense, therefore, that if an individual is diagnosed with STD, they will be more likely to use HIV health services because of their fear of AIDS and perceived disease risk.

But depression is different. It's a mental illness. Individuals with depression may be reluctant to undergo HIV counseling and testing because of psychological problems. Without HIV-related health services, it is easier for individuals to prevent AIDS by using condoms consistently. Studies have shown that MSM is a high-risk group for depression, posing as much of a challenge to their quality of life and public health as HIV does. At the same time, MSM are particularly vulnerable to other mental health disorders and are about twice as likely as heterosexual men to experience some mental health disorders[38]. Due to the lack of supportive environment, the vulnerability of personal privacy information to disclosure in the implementation of HIV health services, as well as AIDS-related discrimination and stigma pose a threat to the quality of health services, and have a serious impact on patients' mental health and the quality of health services. Research by Rames[39] and Yuchen Mao[40] suggests that social stigma is common, and this stigma and social stress can lead to depression, reduced quality of life and negative treatment outcomes. We suggested that regulatory agencies should work to reduce stigma effects. Public health interventions should aim at increased access and effective utilization of services for both HIV/AIDS and mental health services[41].

In addition to the physical, psychological and cognitive factors of the individuals mentioned above, other factors will also affect HIV health services. The enabling factor in the Anderson Behavioral Model refers to the resources or means by which an individual has access to health services, usually involving individual and community resources such as health insurance, income, wealth, availability of services and urban classes. User fees for healthcare services present a barrier to patients accessing healthcare and reduce detection of serious infectious diseases[42]. Because in China, HIV testing is free only in CDC, and testing in other institutions such as hospitals is charged, and is not covered by medical insurance. At the same time, the location of HIV testing is only under some settings, which makes it easier for MSM living in urban areas to access health services. It is therefore proposed to increase the number of health service points in rural areas in order to address the uneven distribution of resources between regions. Of course, there are other problems in HIV health services, such as limited data[43], unreasonable organization of health

institutions[44], and high cost (time cost and human resources) for a health service[2]. The need to combine medical, sociological and psychological considerations also poses a great challenge to the development of health services. Especially for MSM, it needs to be more cautious and careful.

In addition to MSM, some transgender people also deserve attentions. A growing number of studies have focused on transgender people. In comparison to MSM, transgender persons experience additional barriers to accessing health services due to stigma and gender identity issues[45]。

Finally, this paper applies a widely used and relatively mature theoretical model (Anderson Behavioral Model) to HIV health services to better understand and explain the factors affecting health services, and explores the relationship between variables and their impact effects through path analysis, which is feasible and innovative to some extent. However, there are also the following problems: (1) This paper only uses the path analysis method, but does not use the structural equation model. (2) The value of some path coefficients is low and may not be accurate. (3) There are only three health service utilization items included in the analysis, which are not necessarily representative of all health services, because a complex phenomenon and multiple dimensions of access outcomes are available.

Conclusion

Based on Anderson Behavioral Model and path analysis, this paper studies the factors affecting HIV health services. Finally, we conclude that MSM population has a good utilization of health services, but the consistent condom use is not ideal. HIV knowledge is the main factor affecting HIV testing and HIV counseling, followed by age, household registration and other factors. At the same time, the physical and psychological state of the population will also affect the demand for and use of health services. Need factor is the main factor that determine the utilization of health services. The government and relevant departments should strengthen the popularization of disease knowledge and the diagnosis and treatment of individual physical and mental diseases. MSM population with high-risk characteristics should be identified as a priority in the future public health service delivery strategy. In view of these groups, the publicity and education of HIV knowledge should be strengthened, and the utilization of HIV health services should be improved. It is the focus of future research to provide new ideas for health services policy formulation by combining regional, economic, health resources, privacy, psychological problems and other factors. We hope that our study can encourage discussions of HIV health services，and set the stage for sharing and creating for service innovation。

Ethics approval and consent to participate: All procedures of this study were in accordance with the ethical approval granted by the Ethics Committee of Chongqing Medical University. Informed consent was

obtained in writing from all individual participants included in the study, and all methods were carried out in accordance with relevant guidelines and regulations. The Ethics Committee of Chongqing Medical University has reviewed the proposed use of human subjects in the above-mentioned projects. It is recognized that the rights and the welfare of the subjects are adequately protected; the potential risks are outweighed by potential benefits. We approve the project implementation according to plan.

Consent for publication: Not applicable.

Availability of data and materials: The datasets generated and analysed during the current study are not publicly available due [REASON WHY DATA ARE NOT PUBLIC: Because our respondents are sensitive crowd, and related researches are in progress.] but are available from the corresponding author on reasonable request.

Competing interests: Not applicable.

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Figures

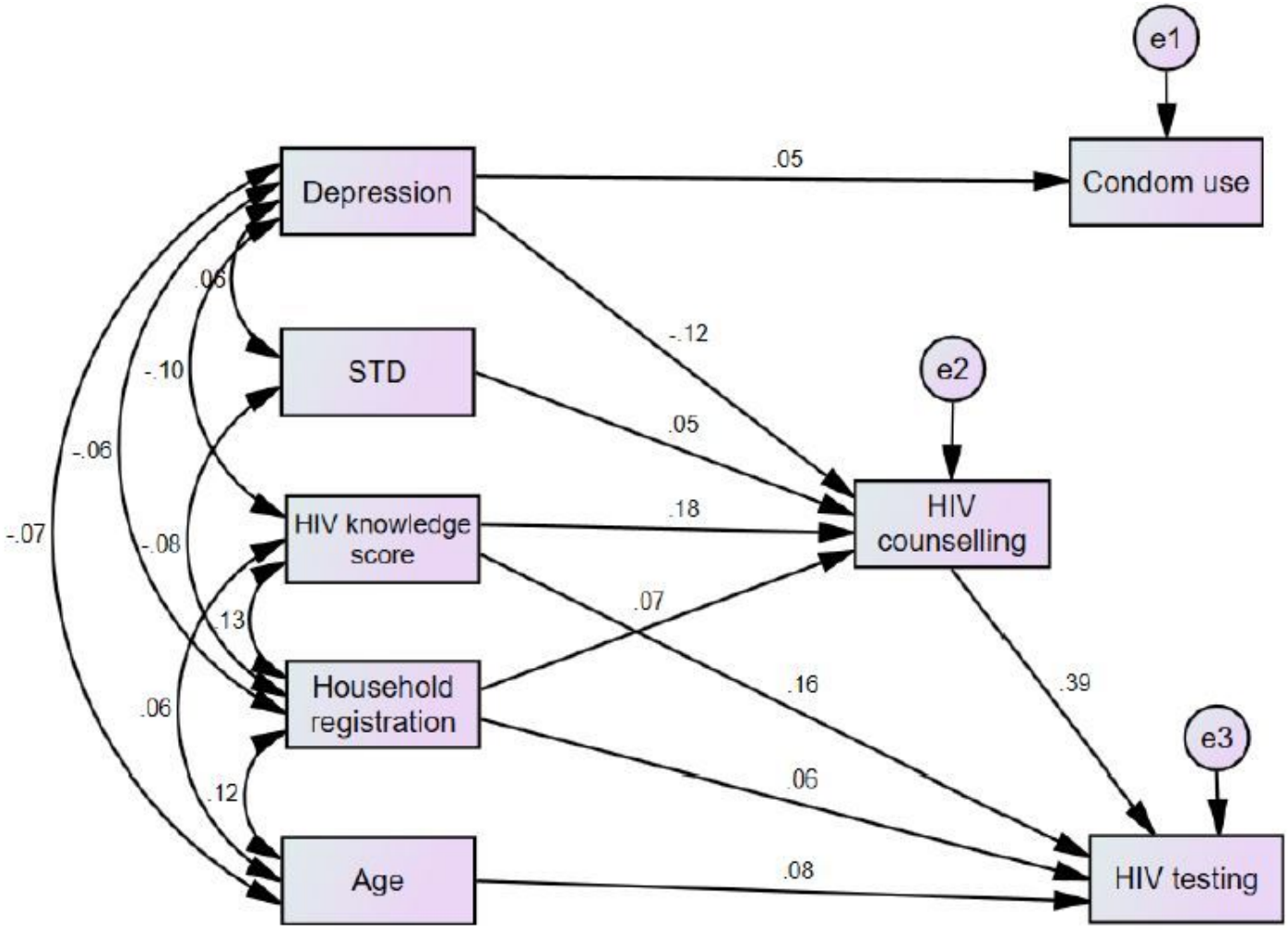

Figure 1

Path analysis diagram