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## Cross-Sectional Study of Factors Associated with Community Health Center Use in a Recently-Urbanized Community in Chengdu, China

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Complete List of Authors:	Liu, Danping; Sichuan University, Department of Health and Social Behavior Meng, Hongdao; University of South Florida, School of Aging Studies Dobbs, Debra; University of South Florida, School of Aging Studies Hyer, Kathryn; University of South Florida, School of Aging Studies Conner, Kyaien; University of South Florida, Department of Mental Health Law & Policy Li, Ningxiu; Sichuan University, Department of Health and Social Behavior Ren, Xiaohui; Sichuan University, Department of Health and Social Behavior Gao, Bo; Sichuan University, Department of Health and Social Behavior
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3 **Cross-Sectional Study of Factors Associated with Community Health Center Use in a**  
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5 **Recently-Urbanized Community in Chengdu, China**  
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9 Danping Liu, PhD, Department of Health and Social Behavior, School of Public Health, Sichuan  
10 University, Chengdu, China  
11

12 Hongdao Meng, PhD, School of Aging Studies, College of Behavioral and Community Sciences,  
13 University of South Florida, USA  
14 Telephone: 813-974-5504  
15 Fax: 813-974-9754  
16 Email: meng@usf.edu  
17  
18

19 Debra Dobbs, PhD, School of Aging Studies, College of Behavioral and Community Sciences,  
20 University of South Florida, USA  
21  
22

23 Kathryn Hyer, PhD, School of Aging Studies, College of Behavioral and Community Sciences,  
24 University of South Florida, USA  
25  
26

27 Kyaaien O. Conner, PhD, LSW, MPH, Department of Mental Health Law & Policy  
28 University of South Florida, USA  
29

30 Ningxiu Li, MD, Department of Health and Social Behavior, School of Public Health, Sichuan  
31 University, Chengdu, China  
32  
33

34 Xiaohui Ren, PhD, Department of Health and Social Behavior, School of Public Health, Sichuan  
35 University, Chengdu, China  
36  
37

38 Bo Gao, MD, Department of Health and Social Behavior, School of Public Health, Sichuan  
39 University, Chengdu, China  
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## Abstract

**Objectives:** Public investment in Community Health Centers (CHCs) in urban areas has been increasing as a response to rapid urbanization in China. The objective of this study was to examine factors associated with CHC use among residents from a recently-urbanized community in Chengdu, China.

**Design:** Cross-sectional design.

**Setting:** A community recently converted to urban status with a newly constructed CHC in Southwest China.

**Participants:** A random sample of 2,400 adults were selected to participate and 2,247 completed the survey in 2013. Residents of Hezuo community who are 18 and above were eligible to participate.

**Outcome Measures:** Trained staff interviewed study participants in their homes and collected data on residents' socio-demographic characteristics, utilization of and satisfaction with CHC. The Andersen behavioral model of health service utilization was used to guide multivariable logistic regression modeling in identifying predisposing, enabling, and need factors associated with the likelihood of using CHC.

**Results:** A total of 71.8% of the respondents reported using CHC during the past year. Factors influencing adults' CHC use included: gender, marital status, education level, and knowledge of one's blood pressure (predisposing factors); annual household per capita income and walking time from home to the CHC (enabling factors); and physical activities (need factor). CHC users reported modest overall satisfaction and higher satisfaction with providers in terms of communication skills and perceived compassionate care. CHC users were less satisfied with medical equipment and quality of health services.

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3 **Conclusions:** To promote CHC use and satisfaction, future research should examine  
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5 interventions aimed at improving access to CHCs, investing in medical equipment and staff  
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7 training, as well as monitoring the quality of health services provided at CHCs.  
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10 **Keywords:** access to health care, health behavior, health services, urbanization  
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## 14 15 16 17 18 19 **Article summary**

### 20 21 **Strengths and limitations of this study**

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24 This study used random household sampling to recruit a large community sample of adults who  
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26 live in a recently urbanized community with access to a newly established community health  
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28 center.  
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32 This is the first study to capture access to community health center in a transitioning urban  
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34 community with relatively low social-economic status.  
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37 The study finding help inform the policy challenge of redirecting large number of visits to  
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39 tertiary hospitals for primary care toward community health centers.  
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42 The cross-sectional study design limits the ability to correlational rather than causal inferences  
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44 regarding the relationship between individual characteristics and outcome variables.  
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47 Self-reported health status measures are not as accurate as those based on physical examinations.  
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## INTRODUCTION

According to the Alma-Ata Declaration, the accessibility to and availability of appropriate primary health care is crucial for attaining socially and economically productive lives.<sup>1</sup> To date, a large body of research indicates that access to primary health care is the key to equity and efficiency in health care and can decrease avoidable hospitalizations and health disparities, as well as improve overall health status.<sup>2-4</sup> Community health service (CHS) is considered the most important strategy for the development of primary health care in many countries, and is well established in developed countries such as the UK, the US, and Australia.<sup>5</sup> Community health centers (CHCs) are the corner stone of an efficient CHS and provide primary care services, prevention services and other related services to community residents. CHCs help ensure that every resident in the community has easy access to primary health care.<sup>6</sup>

In China, major economic reforms implemented since 1978 have brought rapid economic development and urbanization. Over the past three decades, urbanization in China has dramatically increased, with the urban population increasing from 191 million in 1980 to 622 million in 2009.<sup>7</sup> But this rapid social and economic change unfortunately has brought negative effects such as escalating medical costs and an increasing gap between the demand for and supply of effective and safe health care, especially in primary care.<sup>8,9</sup> In addition, rapid population aging coincide with the changing profiles of disease burdens from acute infectious and communicable diseases to chronic non-communicable diseases associated with urbanization and increase the demand for health services.<sup>10,11</sup> This mismatch between increasing demand and limited health care resources has also given rise to increased medical dispute episodes and sometimes strained doctor-patient relationship.<sup>12-15</sup> To address these problems, the Chinese State Council initiated a policy in 1997 declaring that China's health care in urban areas would focus

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3 on strengthening CHS. Since then, CHCs in China have become a critical component of the  
4 health care system and the Chinese government has strongly promoted the establishment of  
5 CHCs and the implementation of CHS. As a result, the number of community health facilities  
6 has increased dramatically from 8,211 in 2002 to 33,736 in 2012.<sup>5,16</sup> CHCs are designed to act as  
7 the foundation and entry point for the health system and are responsible for basic clinical  
8 services and to carry out public health practices.<sup>16</sup> CHCs in China are designed to address six  
9 functions: basic clinical service, prevention, health care service for special populations (primarily  
10 women, children and the elderly), physical rehabilitation, family planning, and health  
11 education.<sup>5,17</sup>

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25 The aim of CHC is to meet the basic health needs of every resident in the community. Thus,  
26 high utilization of and satisfaction with CHC services are important goals for policy-makers and  
27 health managers because they ensure the continuous development of CHCs. As the Chinese  
28 population shifts from the rural to urban areas, the need for access to quality primary care  
29 services available in the community will grow. CHCs are seen as potential solutions to meet this  
30 challenge, however few studies have utilized an empirically based behavioral model to examine  
31 the factors that influence CHC utilization. In addition, previous studies examining utilization of  
32 CHCs have focused on largely stable urbanized populations. To address this gap in the  
33 literature, this study utilized Anderson's behavioral model of Health Service Utilization to  
34 investigate factors associated with adult utilization of and satisfaction with CHSs in a newly-  
35 formed community with a mix of urban and newly urban residents. To our knowledge, this study  
36 is among the first to examine access to a newly built CHC in a recently-urbanized community of  
37 a major city in western China, where economic development has historically lagged behind the  
38 more affluent eastern part of the country.

## METHODS

### Study Setting

This study was conducted in the Hezuo community, one of six sub-districts within a recently developed urban district in Chengdu, Sichuan from January to June in 2013. Chengdu is the capital of Sichuan province in Southwest China and is the largest capital city in China with 14 million residents as of 2010.<sup>18</sup> This study used a cross-sectional research design to assess factors related to utilization of and satisfaction with CHCs.

CHS was developed in Chengdu in the late 1990s. In 2008, the city was selected as one of 28 major cities for the “The National Urban Community Health Service System Building Project” by the Ministry of Health of China. The nationwide project was aimed at pilot testing of CHS systems and accumulating evidence-based recommendations for further CHS development.<sup>15</sup> The CHS system in Chengdu consisted of 64 CHCs located in six districts. Hezuo community in Gaoxin District was chosen for the study because it was recently converted to an urban district with a newly constructed CHC and the great majority of residents were farmers prior to the conversion.

### Study participants

All adult residents aged 18 and older who resided in Hezuo community for at least 6 months at the time of the survey were eligible to participate in this study. All participating households were selected by simple random sampling from the Gaoxin District residency registration system. During the visits to selected residents at their homes, we first explained the aims of the study to an adult from each household. After obtaining informed consent, each participant was then interviewed by trained staff (medical students). The interviews took an average of 20 minutes to complete and each participant received a small gift (worth 10-15 Yuan). The sample size was

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3 determined based on a previous community survey conducted in Chengdu.<sup>19</sup> A total of 2,400  
4 households consented to participate and 2,247 completed the questionnaires (a response rate of  
5 93.6%). All completed questionnaires were checked after the interviews to ensure that there was  
6 no missing information. The study protocol was approved by the Sichuan University Institutional  
7 Review Board.  
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## 14 15 16 **Measures**

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18 CHC utilization was operationalized as a visit to the Hezuo CHC for any health services  
19 (e.g., consultation, physical examination, health education, and disease treatment) Participants  
20 were asked whether they had ever used CHC in the year before the survey. If the answer was  
21 “yes”, they were then asked about their satisfaction with the CHC.  
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28 In the study, the respondents were asked about their satisfaction with various aspects of care,  
29 including technical expertise, wait-time, quality of the facility, medical equipment, physician  
30 communication skills, overall physician service costs and satisfaction. A 5-point Likert scale  
31 ranging from “strongly disagree (1)” to “strongly agree (5)” was used for all satisfaction  
32 questions. In addition, participants answered the following question: “Do you have concerns  
33 about quality of health service when you visit a community health center?” Responses for this  
34 question, were “yes”, “no” and “haven’t thought about it”.  
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45 This study adopted the Health Service Utilization Model proposed by Andersen and  
46 Newman (1973) and Andersen (1995) to examine the factors associated with the utilization of  
47 CHS.<sup>20,21</sup> According to this model, factors contributing to health service utilization include three  
48 domains: predisposing factors, enabling factors, and need factors. Predisposing factors comprise  
49 socio-demographic characteristics and psychosocial characteristics.<sup>22</sup> Enabling factors present  
50 means or opportunities to access needed health services.<sup>23</sup> Need factors reflect the experience of  
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3 symptoms or illness that lead an individual to think that seeking health service is necessary.<sup>24</sup> In  
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5 this survey, measures of predisposing factors included age, gender, marital status, education level,  
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8 employment status, knowledge of one's body weight, and knowledge of one's blood pressure.  
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10 Enabling factors included annual household per capita income, medical insurance, and walking  
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12 time from home to the nearest CHC. Measures of need factors included regular physical  
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14 activities, number of chronic diseases, any acute illness in the two weeks prior to the survey, and  
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16 hospitalization in the previous year.  
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## 20 21 **Statistical Analysis**

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23 All research data were entered into EpiData 3.1 for initial processing. Data analyses were  
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25 conducted using the IBM SPSS (version 22.0). Descriptive statistics for categorical variables  
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27 were reported using percentages (%), and means and standard deviations (SD) for continuous  
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29 variables. Pearson's Chi-square tests were used to analyze the relationship of study variables  
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31 (predisposing factors, enabling factors, and need factors) and the utilization of adults for the  
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33 CHC. Binary logistic regression was applied to examine factors significantly associated with the  
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35 utilization of the CHC (yes/no) among respondents. Results with a p value of <0.05 were  
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37 considered statistically significant. The odds ratio (OR) and 95 % (CI) were also reported.  
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## 45 46 **RESULTS**

### 47 48 **Sample Characteristics**

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50 The characteristics of the sample and differences between CHC users and non-users are  
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52 shown in Table 1. The mean age of the study sample was 46.8 years (SD: 17.0, range: 18-98) and  
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54 52.6% were female. The majority of respondents were married (82.2%) and had low education  
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56 (73.3% having only nine or fewer years of formal education). A great majority were aware of  
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their body weight and blood pressure levels (96.3% and 70.2%, respectively). Regarding the enabling factors, a total of 63.3% had annual household per capita income of 10,000–29,999 RMB. The majority of the sample (94.4%) had medical insurance. Finally, the need factors revealed 22.6% of the participants with at least one chronic disease, 14.1% had being sick in the two weeks prior to the survey and 16.7% had been hospitalized in the previous year. About half of the respondents (53.2%) reported regular physical activities. There were some differences between users and non-users with non-users being younger, and although 52.6% of the participants were female, there were more females in the CHC users group than non-users. Table 1 also reveals that among the 2,247 participants, 1,613 (71.8%) used the CHC in the year before the survey.

Table 1. Sample characteristics by community health center utilization status

Factors	Total (n=2247)	Users (n=1613)	Non-users (n=634)	<i>p</i> value
<b>Predisposing factors:</b>				
Age (%)				<0.001
18-24	8.8	7.0	13.4	
25-34	19.1	17.7	22.7	
35-44	20.9	19.3	25.1	
45-54	16.6	16.2	17.4	
55-64	16.1	17.8	11.7	
65-	18.6	22.0	9.8	
Gender (%)				<0.001
Male	47.4	44.5	54.6	
Female	52.6	55.5	45.4	
Marital status (%)				<0.001
Never married	9.3	6.0	17.8	
Married	82.2	84.4	76.7	
Divorced or widowed	8.4	9.5	5.5	
Education level (%)				<0.001
No formal education	9.6	10.0	8.7	
Elementary school	29.7	32.2	23.3	

Middle school	34.0	35.0	31.4	
High or vocational school	16.3	14.4	21.1	
College and above	10.4	8.4	15.5	
Employment status (%)				<0.001
Employed	50.4	46.1	61.4	
Retired	6.5	7.4	3.9	
Student	1.3	0.8	2.7	
Unemployed	41.8	45.6	32.0	
Aware of body weight (%)	96.3	96.2	96.4	0.862
Aware of blood pressure level (%)	70.2	74.9	58.2	<0.001
<b>Enabling factors:</b>				
Annual household per capita income (Yuan) (%)				0.001
0-5,000	3.3	4.0	1.6	
5,000-9,999	15.0	14.9	15.5	
10,000-29,999	63.3	64.5	60.3	
30,000-49,999	12.5	11.3	15.6	
≥ 50,000	5.9	5.4	7.1	
Has medical insurance (%)	94.4	95.4	92.1	0.003
Walking time from home to the CHC (%)				0.025
≤15 minutes	86.3	87.4	83.8	
>15 minutes	13.7	12.6	16.2	
<b>Need factors:</b>				
Regular physical activities (%)				<0.001
Yes	53.2	56.4	45.1	
Number of chronic diseases (%)				<0.001
0	77.4	74.5	84.9	
1	16.3	17.8	12.5	
2 or more	6.3	7.7	2.7	
Being sick in the two weeks prior to the survey (%)	14.1	15.6	10.3	0.001
Hospitalized in prior year (%)	16.7	19.3	10.1	<0.001

### Relationship between Individual Characteristics and Utilization of CHC

Bivariate analysis revealed that six predisposing factors (age, gender, marital status, education level, employment status, and knowledge of one's blood pressure) were significantly associated with using CHC within the previous year. Only knowledge of one's body weight was

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3 not associated with use of CHC. All three enabling factors (annual household per capita income,  
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5 medical insurance and walking time from home to the nearest CHC) and the four need factors  
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7 (regular physical activities, number of chronic diseases, illness in the two weeks before the  
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9 survey, and hospitalization in prior year) also had a significant ( $p < 0.05$ ) relationship with adult  
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11 use of CHC.  
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### 14 15 16 **Multivariable Analyses of Individual Factors Associated with CHC Utilization** 17

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19 Table 2 depicts the results of the multivariate logistic regression model predicting the  
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21 likelihood of CHC use. Four predisposing factors (gender, marital status, education level,  
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23 knowledge of one's blood pressure), two enabling factors (annual household per capita income  
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25 and walking time from home to the nearest CHC) and one need factor (regular physical  
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27 activities) had a significant independent effect on the use of CHC among adults. Female adults  
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29 were more likely to use CHC (OR = 1.395, 95 % CI: 1.139-1.708). Compared with never  
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31 married adults, married and divorced or widowed adults were 2.749 and 2.992 times more likely  
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33 to use CHC, respectively (OR=2.749, 95% CI: 1.889-4.000 for married, and OR=2.992, 95% CI:  
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35 1.689-5.300 for divorced or widowed). Both elementary school education and middle school  
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37 education had significant positive effects on adults using CHC as compared to those with no  
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39 formal education, at 1.771 and 2.288 times of the odds, respectively (OR = 1.771, 95% CI:  
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41 1.186-2.645 for elementary school education, and OR = 2.288, 95% CI: 1.468-3.586 for middle  
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43 school education). Those who knew their blood pressure were more likely to use CHC (OR =  
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45 1.916, 95% CI: 1.551-2.369). Household income was negatively associated with CHC use.  
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47 Compared with adults belonging to group "<5,000", adults in group "5,000-", "10,000-",  
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49 "30,000-" and "50,000-" were less likely to use CHC when they felt sick (OR=0.282, 95% CI:  
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51 0.133-0.594 for group "5,000- ", OR=0.306, 95% CI: 0.149-0.625 for group "10,000- ",  
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OR=0.212, 95% CI: 0.100-0.449 for group “30,000- ”, and OR=0.235, 95% CI: 0.105-0.525 for group “50,000- ”, respectively). Walking time from home to the nearest CHC was negatively associated with CHC use. Compared with adults belonging to group “≤15minutes”, adults belonging to group “>15 minutes” were less likely to use CHC (OR=0.582, 95% CI: 0.439-0.772). Physical activities had a positive effect for using CHC and adults reporting regular physical activities were more likely to use CHC (OR = 1.282, 95% CI: 1.042-1.577).

Table 2. Logistic regression model examining factors associated with the likelihood of using community health center

	Coefficient	p value	OR	95% CI
<b>Predisposing factors:</b>				
Age				
18-24	Ref.			
25-34	-0.149	0.500	0.862	(0.559, 1.328)
35-44	-0.382	0.106	0.683	(0.430, 1.084)
45-54	-0.393	0.114	0.675	(0.415, 1.099)
55-64	0.034	0.907	1.035	(0.582, 1.841)
65-	0.475	0.136	1.608	(0.861, 3.006)
Gender				
Male	Ref.			
Female	0.333	<b>0.001</b>	1.395	(1.139, 1.708)
Marital status				
Never married	Ref.			
Married	1.011	<b>&lt;0.001</b>	2.749	(1.889, 4.000)
Divorced or widowed	1.096	<b>&lt;0.001</b>	2.992	(1.689, 5.300)
Education, level				
No formal education	Ref.			
Elementary school	0.572	<b>0.005</b>	1.771	(1.186, 2.645)
Middle school	0.828	<b>&lt;0.001</b>	2.288	(1.468, 3.586)
High or vocational school	0.381	0.132	1.464	(0.891, 2.406)
College and above	0.384	0.173	1.469	(0.844, 2.555)
Employment status				
Employed	Ref.			
Retired	0.205	0.464	1.227	(0.710, 2.120)
Student	-0.220	0.605	0.802	(0.348, 1.850)
Unemployed	0.087	0.526	1.091	(0.833, 1.429)

Knowledge of one's body weight				
No	Ref.			
Yes	-0.352	0.195	0.703	(0.413, 1.198)
Knowledge of one's blood pressure				
No	Ref.			
Yes	0.650	<0.001	1.916	(1.551, 2.369)
<b>Enabling factors:</b>				
Annual household per capita income (Yuan)				
0-5,000	Ref.			
5,000-9,999	-1.268	0.001	0.282	(0.133,0.594)
10,000-29,999	-1.185	0.001	0.306	(0.149,0.625)
30,000-49,999	-1.552	<0.001	0.212	(0.100,0.449)
≥ 50,000	-1.448	<0.001	0.235	(0.105,0.525)
Has medical insurance				
No	Ref.			
Yes	0.234	0.258	1.264	(0.843, 1.895)
Walking time from home to the CHC				
≤15 minutes	Ref.			
>15 minutes	-0.541	<0.001	0.582	(0.439, 0.772)
<b>Need factors:</b>				
Regular physical activities				
No	Ref.			
Yes	0.248	0.019	1.282	(1.042, 1.577)
Number of chronic diseases				
0	Ref.			
1	-0.121	0.472	0.886	(0.637,1.232)
2 or more	0.330	0.281	1.391	(0.763,2.538)
Being sick in the two weeks prior to the survey	0.282	0.080	1.326	(0.967, 1.818)
Hospitalized in prior year	0.288	0.102	1.334	(0.944, 1.884)

### Satisfaction with the CHC

For those who used CHC, Table 3 describes the satisfaction with the CHC and calculated the average scores and SD of their satisfaction with CHC. The overall satisfaction scores was 3.87 (SD=0.49) on a 5-point scale, indicating modest satisfaction. Respondents were more satisfied with communication with providers (3.92±0.50) and the perceived compassionate care

(3.96±0.49) and less satisfied with quality of medical equipment (3.59±0.69). In addition, 14.7% of the adults expressed concerns about the quality of health services when they visit a community health center.

Table 3. Resident satisfaction with the community health center on a scale of 1 (not at all satisfied) to 5 (highly satisfied)

Items	Mean	SD
Technical ability of staff	3.74	0.59
Wait time	3.73	0.52
Facilities	3.81	0.49
Equipment	3.59	0.69
Communication with the providers	3.92	0.50
Perceived compassionate care	3.96	0.49
Costs	3.87	0.53
Overall	3.87	0.49

## DISCUSSION

This study is the first to focus on the utilization of CHC among community dwelling adults in a recently-urbanized community in China. Urbanization can provide opportunities for improving population health by increasing access to better equipment and health services and education than is available in rural areas. At the same time, it may also bring unique challenges in that urbanization increases exposure to major health risk factors such as environmental pollution, occupational hazards, diets with more processed foods and more unhealthy food choices, as well as physical inactivity.<sup>7</sup> The health consequences of rapid urbanization such as the increase of chronic diseases are more and more evident in China. Chronic diseases was estimated to contribute to 80% of deaths and 70% of disability-adjusted life-years (DALYs) lost in China.<sup>25,26</sup> Thus establishing new and strengthening existing CHCs have been viewed as one of the key strategies in addressing these issues.

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There are multiple reasons explaining why 28.2% of study respondents did not use CHC in the last year. First, many residents may not be aware of services provided at CHC and there are large variations in awareness of CHC and its services among residents.<sup>17</sup> For example, a study in the southern city of Zhuhai showed that 38.4% of those surveyed were unaware of services provided by CHC<sup>27</sup> and another study of the eastern province of Jiangsu found 25.1% of residents were unaware of their community CHC.<sup>28</sup> Second, some residents may not trust CHC as high quality health services providers as compared to tertiary hospitals.<sup>1,17</sup> Third, residents' knowledge about the importance of preventive care and health promotion may not be adequate.<sup>17</sup> This is especially true for the newly urbanized residents, the majority of whom were farmers not long before and they often lacked enough health literacy due to poor socioeconomic status.<sup>29</sup> Therefore, it is important to promote health education among community residents and to improve their knowledge of the health service functions of CHC and their importance in maintaining and improving health through regular visits to CHC.

Understanding the factors affecting the use of CHCs is very important for providing true equality of access to CHCs. This study adopted the Anderson Model of Health Service Utilization to identify what determines CHC use among adults by categorizing associated factors as predisposing factors, enabling factors, and need factors. Results revealed that the above three kinds of factors affected the utilization of CHC among adults.

Compared to males, a higher proportion of females had utilized CHC in the past year. This finding is consistent with other related studies that found females to be more likely to have contact with the healthcare system than males.<sup>8,30-32</sup> Some studies observed that education was associated with hospital or CHS choice.<sup>5,8</sup> In this study, we observed a positive association between elementary and middle school education and CHC use compared to those with no



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2  
3 formal education. This study indicated that marital status was significantly associated with CHC  
4 use and married and divorced or widowed adults were more likely to utilize CHC compared to  
5 never married adults. A similar result was found in Blackwell's study that never-married adults  
6 in Canada were less likely to use hospitalization compared to married adults.<sup>24</sup> In addition, our  
7 study found that knowing about one's blood pressure had positive association with CHC use and,  
8 to some extent, revealed that the importance of health consciousness for promoting the utilization  
9 of CHC.  
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20 As an enabling factor, household income was found to have different effects on healthcare  
21 utilization in previous studies. Some studies indicated that low household income was the  
22 consistent predictor of low use of healthcare services.<sup>33-35</sup> Other studies concluded that income  
23 was not associated with health service utilization.<sup>31,36,37</sup> In our study, household income was  
24 found to be negatively associated with CHC use in that adults with higher household income  
25 were less likely to use CHC. In China, many residents with higher household income may prefer  
26 to visit the hospital when they were sick without considering the severity of disease. And this, to  
27 some degree, caused the public problem "too difficult and too expensive to see a doctor in  
28 hospitals" existing in the health services system in China. Another reason that explain low CHC  
29 utilization is that residents did not know about the service items provided by CHC and/or they  
30 lacked enough trust for CHC and think that the service quality of CHC is low.<sup>1,8,17</sup> To improve  
31 the utilization of CHC, it is necessary to advertise the CHC among community residents and to  
32 build trust in the quality of care CHCs provide.  
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51 Previous studies showed that distance is an important determinant of health service demand  
52 and can affect the utilization of health services.<sup>8,38,39</sup> Our study also found that walking  
53 distance/time from home to the nearest CHC had a negative relationship with the likelihood of  
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3 CHC use. Results revealed, to some extent, that convenience would promote CHC use. In  
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5 addition, regular physical activities were found to be associated with higher likelihood of CHC  
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7 use among adults in the current study. The explanation may be higher awareness of benefits of  
8  
9 healthy behaviors among those with regular physical activities.  
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13 The results of CHC users' satisfaction investigation with the CHC revealed that CHC users  
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15 were generally more satisfied with the communication with providers and the perceived  
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17 compassionate care, and less satisfied with the quality of medical equipment in CHC. At the  
18  
19 same time, 14.7% of CHC users worried about the quality of health service provided by CHC.  
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21 This finding suggests that the Chinese government should take measures to increase financial  
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23 investment to improve the infrastructure and medical equipment in CHC and to improve the  
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25 training and qualifications of the providers. Evidence exists that partnerships between CHCs and  
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27 tertiary hospitals may help bridge the gap between providers' skills and efficiency and consumer  
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29 demand for quality in health care.<sup>15</sup>  
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35 Different from previous CHC utilization studies carried out in China which were based on  
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37 patients in CHCs, this study was implemented in a population-based sample. Results are  
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39 generalizable to sub-urban communities with similar characteristics in western China. This study  
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41 also has certain limitations. The major limitation is the cross-sectional design which prevents our  
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43 ability to establish causal relationships between factors and CHC use. In addition, some  
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45 predisposing factors such as health beliefs have not been taken into consideration, which may  
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47 also impact the utilization of health services.  
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## 52 CONCLUSIONS

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54 Understanding the factors affecting the use of CHC is paramount for providing equal access  
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56 to primary health services. This study reported the utilization of and satisfaction with CHC  
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3 among adults in a recently-urbanized community of China. The results of this study yield several  
4 implications for policy and practice. While important progress has been made in the development  
5 and strengthening of CHCs in urban areas and many community-dwelling adults are using CHCs,  
6 results of our investigation suggest there is still room for improvement in the utilization of CHCs  
7 for routine health care. Satisfaction survey results indicated that more can be done to strengthen  
8 the CHC infrastructure and staff competency, to educate and engage consumers in the awareness  
9 of health promotion and healthy behaviors. To improve CHC use and satisfaction, governmental  
10 policies need to direct more financial resources into marketing the services offered and the  
11 convenience of CHCs, as well as into the medical equipment available and staff training to  
12 improve the quality of health services provided at CHCs. Health promotion campaigns targeted  
13 at community residents are also necessary to improve health consciousness of residents in an  
14 effort to increase participants' trust in CHCs. Future studies should examine to what extent  
15 predisposing factors, enabling factors and need factors can be modified to improve access to  
16 CHCs.  
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### Contributorship

Each of the authors contributed to the preparation and editing of the manuscript. DL, NL, XR, and BG designed the study, collected the data, and conducted the literature review. DL and HM analyzed the data and drafted the manuscript. DD, KH, and KC contributed to data interpretation and critical revisions of the manuscript.

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### Competing interests

None.

### Data Sharing Statement

No additional data are available.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	8
		(b) Describe any methods used to examine subgroups and interactions	8
		(c) Explain how missing data were addressed	n/a
		(d) If applicable, describe analytical methods taking account of sampling strategy	n/a
		(e) Describe any sensitivity analyses	n/a
<b>Results</b>			



Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	7
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9
		(b) Indicate number of participants with missing data for each variable of interest	n/a
Outcome data	15*	Report numbers of outcome events or summary measures	9
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11-13
		(b) Report category boundaries when continuous variables were categorized	9,10,12,13
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	14-15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	15-17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	19

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

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# BMJ Open

## Cross-Sectional Study of Factors Associated with Community Health Center Use in a Recently-Urbanized Community in Chengdu, China

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Complete List of Authors:	Liu, Danping; Sichuan University, Department of Health and Social Behavior Meng, Hongdao; University of South Florida, School of Aging Studies Dobbs, Debra; University of South Florida, School of Aging Studies Conner, Kyaien; University of South Florida, Department of Mental Health Law & Policy Hyer, Kathryn; University of South Florida, School of Aging Studies Li, Ningxiu; Sichuan University, Department of Health and Social Behavior Ren, Xiaohui; Sichuan University, Department of Health and Social Behavior Gao, Bo; Sichuan University, Department of Health and Social Behavior
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Secondary Subject Heading:	Epidemiology, Health services research
Keywords:	access, health behavior, health services, urbanization

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3 **Cross-Sectional Study of Factors Associated with Community Health Center Use in a**  
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5 **Recently-Urbanized Community in Chengdu, China**  
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9 Danping Liu, PhD, Department of Health and Social Behavior, School of Public Health, Sichuan  
10 University, Chengdu, China  
11

12 Hongdao Meng, PhD, School of Aging Studies, College of Behavioral and Community Sciences,  
13 University of South Florida, USA  
14 Telephone: 813-974-5504  
15 Fax: 813-974-9754  
16 Email: meng@usf.edu  
17  
18

19 Debra Dobbs, PhD, School of Aging Studies, College of Behavioral and Community Sciences,  
20 University of South Florida, USA  
21

22 Kyaïen O. Conner, PhD, LSW, MPH, Department of Mental Health Law & Policy  
23 University of South Florida, USA  
24

25 Kathryn Hyer, PhD, School of Aging Studies, College of Behavioral and Community Sciences,  
26 University of South Florida, USA  
27

28 Ningxiu Li, MD, Department of Health and Social Behavior, School of Public Health, Sichuan  
29 University, Chengdu, China  
30

31 Xiaohui Ren, PhD, Department of Health and Social Behavior, School of Public Health, Sichuan  
32 University, Chengdu, China  
33

34 Bo Gao, MD, Department of Health and Social Behavior, School of Public Health, Sichuan  
35 University, Chengdu, China  
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## Abstract

**Objectives:** Public investment in Community Health Centers (CHCs) has been increasing as a response to rapid urbanization in China. The objectives of this study were: 1) to examine factors associated with CHC use among residents from a recently-urbanized community in western China; and 2) to describe satisfaction with CHC among users.

**Design:** Cross-sectional design.

**Setting:** A community recently converted to urban status with a newly constructed CHC in Southwest China.

**Participants:** A random sample of 2,259 adults in the Hezuo community in Chengdu, China completed the survey in 2013.

**Outcome Measures:** Trained staff interviewed study participants in their homes using structured questionnaires. The survey included questions regarding socio-demographics, health status, access to and utilization of health care, health behaviors, and CHC utilization. The Andersen behavioral model of health service utilization was used to guide multivariable logistic regression modeling in identifying predisposing, enabling, and need factors associated with the likelihood of using CHC. Descriptive statistics were used to describe residents' satisfaction with the CHC.

**Results:** A total of 71.8% of the respondents reported using the CHC during the past year. Factors influencing adults' CHC use included: gender, marital status, education level, and knowledge of one's blood pressure (predisposing factors); annual household per capita income and walking time to the CHC (enabling factors); and self-rated health as well as physical activities (need factor). CHC users reported modest satisfaction across various aspects of the CHC.

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3 **Conclusions:** Neighborhood CHC in urban areas provide important services to these residents  
4 living in a recently-urbanized community. All three categories of factors in the Andersen model  
5 help explain the likelihood of CHC use. There is much room for improvement in CHC to  
6 enhance customer satisfaction. Future research is needed to improve access to CHCs and  
7 promote their use in urbanized populations with low to modest education.  
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12 **Keywords:** access to health care, health services, satisfaction, urbanization  
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## 15 16 17 18 19 20 21 **Article summary**

### 22 23 **Strengths and limitations of this study**

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26 This study used random household sampling to recruit a large community sample of adults who  
27 live in a recently urbanized community with access to a newly established community health  
28 center.  
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33 This is the first study to capture access to community health center in a transitioning urban  
34 community with relatively low social-economic status from western China.  
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39 The study findings help policymakers understand why individuals use community health centers  
40 and which aspects of care delivery can be improve to enhance user experience.  
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44 The cross-sectional study design limits the ability to correlational rather than causal inferences  
45 regarding the relationship between individual characteristics and community health center use.  
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49 Self-reported health status measures are not as accurate as those based on physical examinations.  
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## INTRODUCTION

According to the Alma-Ata Declaration, access to primary care is crucial for attaining socially and economically productive lives.<sup>1</sup> To date, a large body of research indicates that access to primary care is one of the key metrics of measuring equity and efficiency in health care systems and it can reduce health disparities and avoidable hospitalizations as well as improve overall health status.<sup>2-5</sup> Community health services (CHS) is well established in developed countries such as the UK, the US, and Australia and it is considered one of the most important strategies for the development of primary health care in developing countries.<sup>6</sup> Community health centers (CHCs), mostly government operated, are the corner stone of China's Urban Health Care Reform as they are tasked with providing primary care and prevention to neighborhood residents.<sup>6,7</sup>

The economic reforms implemented since 1978 have brought rapid economic development and urbanization to China, with the urban population increasing from 191 million (1980) to 779 million in 2015.<sup>8,9</sup> But this unprecedented economic growth unfortunately was also associated with negative effects such as escalating medical costs and an increasing gap between the demand for and supply of effective health service, especially in primary care.<sup>10,11</sup> In addition, rapid population aging coincide with the changing profiles of disease burden from acute infectious and communicable diseases to chronic non-communicable diseases which in turn increase the demand for health services.<sup>12,13</sup> This mismatch between increasing demand and limited health care resources has also given rise to increased tensions between patients and medical care providers, with the occasional violent incidences reported by the media.<sup>14-16</sup> To address these problems, the Chinese State Council initiated a policy in 1997 declaring that China's health care in urban areas would focus on strengthening CHS. Since then, CHCs in

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3 China have become a critical component of the health care system and the Chinese government  
4 has strongly supported the establishment of CHCs. Further, it has designed the CHCs to act as  
5 the foundation and entry point for the health system. CHCs are responsible for routine primary  
6 care, physical rehabilitation, and public health practices (family planning and health  
7 education).<sup>6,7,17</sup> As a result, the number of community health facilities has increased dramatically  
8 from 8,211 to 33,736 between 2002 and 2012.<sup>6,17</sup>  
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18 The main goal of CHCs is to meet the basic health needs of every resident in the community.  
19 Thus, easy access to and satisfaction with CHC services are important benchmarks for policy-  
20 makers and health care administrators because they ensure the continuous development of CHCs.  
21 As urbanization of the Chinese population continues, demand for easy access to high quality  
22 primary care services in the community will remain elevated.<sup>18</sup> While CHCs have been identified  
23 as the preferred policy solution to meet this challenge,<sup>19,20</sup> few studies have utilized an  
24 empirically based behavioral model to examine the factors that influence CHC utilization.<sup>21-23</sup> In  
25 addition, there is a lack of research on recently urbanized populations, which has been a  
26 relatively new phenomenon, despite the initial evidence suggesting simultaneous improving and  
27 worsening health associated with urbanization in developing countries.<sup>9,24,25</sup> To address this gap  
28 in the literature, this study utilized the Andersen behavioral model of health service utilization to  
29 investigate factors associated with adult utilization of and satisfaction with CHCs in a newly-  
30 formed community with a mix of urban and newly urban residents.  
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49 The objectives of this study were: 1) to examine factors associated with CHC use among  
50 residents from a recently-urbanized community in western China; and 2) to describe satisfaction  
51 with CHC among users. To our knowledge, this study is among the first to examine access to a  
52 newly built CHC in a recently-urbanized community of a major city in western China, where the  
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3 pace of economic development has historically lagged behind the more affluent eastern part of  
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5 the country.  
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## 8 9 **METHODS**

### 10 11 **Study Setting**

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14 This study used a cross-sectional research design and was conducted in the Hezuo  
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16 community, one of six sub-districts within a recently developed urban district in Chengdu,  
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18 Sichuan from January to June in 2013. Chengdu is the capital of Sichuan province in Southwest  
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20 China and ranked 7<sup>th</sup> most populous metropolitan area city in China with 14 million residents as  
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22 of 2010.<sup>26</sup>  
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26 CHS was developed in Chengdu in the late 1990s. In 2008, the city was selected as one of  
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28 28 major cities for the “The National Urban Community Health Service System Building  
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30 Project” by the Ministry of Health of China. The nationwide project was aimed at pilot testing of  
31  
32 CHS systems and accumulating evidence-based recommendations for further CHS  
33  
34 development.<sup>16</sup> The CHS system in Chengdu consisted of 64 CHCs located in six urban districts.  
35  
36 Hezuo community (Gaoxin District, population 51,389 as of 2012) was chosen for the study  
37  
38 because it began the rural-to-urban conversion process in 2006. Prior to the conversion, virtually  
39  
40 all residents were farmers and the conversion process is still ongoing. Hezuo CHC, a newly  
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42 constructed facilitate opened to the community residents for service in 2007, is staffed by 66 full-  
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44 time health care professionals, including 17 licensed physicians in primary care, ten licensed  
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46 physician in traditional Chinese medicine, 28 registered nurses, 10 medical technologists, and a  
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48 contracted supporting staff. Besides the CHC, there are three other hospitals and seven private  
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50 clinics in the community.  
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### 56 57 **Study participants**

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3 All adult residents aged 18 and older who resided in Hezuo community for at least 6 months  
4 at the time of the survey were eligible to participate in this study. A sample size of 1000  
5 households was determined based on published community health assessment guidelines.<sup>27,28</sup> A  
6 three-stage sampling process was used to ensure the sample is representative of all residents. In  
7 the first stage, all housing developments (similar to the Homeowners Association in the U.S.)  
8 from the six neighborhood committees in Hezuo Sub-District were stratified into government-  
9 sponsored housing developments (as part of the urbanization land development) and commercial  
10 developments (typically higher priced). In stage 2, building units were randomly sampled from  
11 the specific housing developments in stage 1. Computer-generated random numbers were used to  
12 determine specific housing developments (stage 1) and building units (stage 2). Finally,  
13 systematic random sampling were used to select even or odd number of building units from those  
14 identified in stage 2. During the visits to respondents' homes, we first explained the aims of the  
15 study to an adult from each household. After obtaining informed consent, each participant was  
16 interviewed by trained staff (medical and public health students, and community volunteers). The  
17 interviews took an average of 20 minutes to complete and each participant received a small gift  
18 (worth 10-15 Yuan) as a token of appreciation at the end of the interview. A total of 1,008  
19 households agreed to participate in the survey and 2,259 adults out of a total of 2653 adults in  
20 these households returned questionnaires (a response rate of 85.1%). Questionnaires were  
21 checked after the interviews for completeness. Twelve records were excluded from the analysis  
22 due to missing information on CHC use. The study protocol was approved by the Sichuan  
23 University Institutional Review Board.

## 54 Measures

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The questionnaire was adapted from a number of structured household surveys on community health assessment.<sup>27,29</sup> The survey included the following domains of questions: 1) socio-demographics (age, gender, marital status, residence registration, insurance, income, education, occupation); 2) health status and health behaviors (the number of physician diagnosed common chronic conditions, diet and physical activity); 3) access to care (care-seeking behavior, location of care, type of provider, past year hospital use and health care expenditures); and 4) CHC awareness and utilization. CHC utilization was operationalized as an affirmative response to the question: “in the past year, have you used the Hezuo CHC for any of the following: physician office visit, physical examination, health information or education?” Among respondents who have used the CHC, they were then asked about their satisfaction with various aspects of care, including staff technical expertise, wait-time, quality of the facility, quality of the medical equipment, physician-patient communication skills, cost of care, and overall satisfaction with the CHC. A 5-point Likert scale ranging from “Highly dissatisfied (1)” to “Highly satisfied (5)” was used for all satisfaction questions.

This study adopted the Andersen Behavioral Model of Health Services Utilization to examine the factors associated with the utilization of CHS.<sup>30,31</sup> According to this model, factors contributing to health service use can be classified in three domains: predisposing, enabling, and need. Predisposing factors comprise socio-demographic characteristics and psychosocial characteristics.<sup>32</sup> Enabling factors present means or opportunities to access needed health services. Need factors reflect the experience of symptoms or illness that lead an individual to think that seeking health service is necessary.<sup>33</sup> In this survey, measures of predisposing factors included age, gender, marital status, education level, employment status, knowledge of one’s body weight, and knowledge of one’s blood pressure. Enabling factors included annual

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3 household per capita income, medical insurance, and walking time from home to the nearest  
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5 CHC. Measures of need factors included self-rated health, regular physical activities, number of  
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7 chronic diseases, any acute illness in the two weeks prior to the survey, and hospitalization in the  
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9 previous year.  
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### 11 12 13 **Statistical Analysis**

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15 All research data were entered into EpiData 3.1 for initial processing (validity check, quality  
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17 control, and verification).<sup>34</sup> Statistical analyses were conducted using the IBM SPSS (version  
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19 23.0. Armonk, NY: IBM Corp.). We first presented individual characteristics of the sample as a  
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21 whole and then by CHC use status (non-users versus users). We reported means and standard  
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23 deviations (SD) as descriptive statistics for continuous variables and percentages (%) for  
24  
25 categorical variables. Pearson's Chi-squared tests were used to examine differences for  
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27 categorical variables, and t-tests were used to examine differences for continuous variables. We  
28  
29 then estimated binary logistic regression models to examine the relationship of study variables  
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31 (predisposing factors, enabling factors, and need factors) and the likelihood of CHC use. We  
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33 adjusted the standard errors for clustering of individuals in households to allow for intra-family  
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35 correlation.<sup>35</sup> Results with a p value of  $<0.05$  were considered statistically significant.  
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## 42 **RESULTS**

### 43 44 **Sample Characteristics**

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46 Individual characteristics of the sample and differences in these characteristics between  
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48 CHC users and non-users are shown in Table 1. The mean age of the study sample was 46.8  
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50 years (SD=17.0, range: 18-98) and 52.6% were female. The majority of respondents were  
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52 married (82.2%) and only 26.7% had more than nine years of formal education. While an  
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overwhelming majority (96.3%) were aware of their body weight, less than two-thirds (70.2%) knew their recent blood pressure measures. Regarding the enabling factors, only 5.9% of the sample had annual per capita income of 50,000 Yuan but most (94.4%) had medical insurance. Finally, the need factors showed that 22.6% of the participants had at least one chronic disease, 14.1% had being sick in the two weeks prior to the survey and 16.7% had been hospitalized in the previous year. Overall, 1,613 (71.8%) used the CHC in the year before the survey. The comparisons between CHC users and non-users showed that they were different in almost all predisposing (age, gender, marital status, education level, employment status, and knowledge of one's blood pressure), enabling (annual household per capita income, medical insurance and walking time from home to the nearest CHC) and need factors (self-rated health, regular physical activities, number of chronic diseases, illness in the two weeks before the survey, and hospitalization in prior year). The exception to this was body weight awareness ( $p=0.862$ ).

Table 1. Sample characteristics by community health center utilization status

Factors	Total (n=2247)	Non-users (n=634)	Users (n=1613)	<i>p</i> value
<b>Predisposing factors:</b>				
Age, mean (SD)	46.8(17.0)	41.9(15.9)	48.8(17.1)	<0.001
Age group (%)				<0.001
18-24	8.8	13.4	7.0	
25-34	19.1	22.7	17.7	
35-44	20.9	25.1	19.3	
45-54	16.6	17.4	16.2	
55-64	16.1	11.7	17.8	
65+	18.6	9.8	22.0	
Gender (%)				<0.001
Male	47.4	54.6	44.5	
Female	52.6	45.4	55.5	
Marital status (%)				<0.001
Never married	9.3	17.8	6.0	
Married	82.2	76.7	84.4	

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3	Divorced or widowed	8.4	5.5	9.5	
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5	Education level (%)				<0.001
6	No formal education	9.6	8.7	10.0	
7	Elementary school	29.7	23.3	32.2	
8	Middle school	34.0	31.4	35.0	
9	High or vocational school	16.3	21.1	14.4	
10	College and above	10.4	15.5	8.4	
11					
12	Employment status (%)				<0.001
13	Currently employed	50.4	61.4	46.1	
14	Retired	6.5	3.9	7.4	
15	Not employed	43.1	34.6	46.5	
16	Aware of body weight (%)	96.3	96.4	96.2	0.862
17	Aware of blood pressure level (%)	70.2	58.2	74.9	<0.001
18					
19	<b>Enabling factors:</b>				
20	Annual household per capita income (Yuan) (%)				0.001
21	≤4,999	3.3	1.6	4.0	
22	5,000-9,999	15.0	15.5	14.9	
23	10,000-29,999	63.3	60.3	64.5	
24	30,000-49,999	12.5	15.6	11.3	
25	≥ 50,000	5.9	7.1	5.4	
26	Has medical insurance (%)	94.4	92.1	95.4	0.004
27	Walking time from home to the CHC (%)				0.029
28	≤15 minutes	86.3	83.8	87.4	
29	> 15 minutes	13.7	16.2	12.6	
30					
31	<b>Need factors:</b>				
32	Self-rated health				<0.001
33	Very poor or poor	2.5	0.6	3.3	
34	Fair	18.6	11.8	21.2	
35	Good	45.4	43.0	46.3	
36	Very good	33.5	44.5	29.1	
37	Number of chronic diseases (%)				<0.001
38	0	77.4	84.9	74.5	
39	1	16.3	12.5	17.8	
40	2 or more	6.3	2.7	7.7	
41	Regular physical activities (%)	53.2	45.1	56.4	<0.001
42	Being sick in the two weeks prior to the survey (%)	14.1	10.3	15.6	0.001
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44	Hospitalized in prior year (%)	16.7	10.1	19.3	<0.001
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Table 2 shows the results of the multivariable logistic regression model predicting the likelihood of CHC use. Four predisposing factors (female, marital status, education level, knowledge of one's blood pressure), two enabling factors (per capita annual household income and walking time to the nearest CHC under 15 minutes) and two need factor (self-rated health and regular physical activities) had a significant independent effect on the likelihood CHC use. Women were 39% more likely than men to have used CHC (OR = 1.39, 95% CI: 1.20-1.62). Compared with never married adults, married/divorced/widowed adults were much more likely to use CHC. Both elementary school education and middle school education had significant positive effects on adults using CHC as compared to those with no formal education, however, the effect of additional education beyond middle school did not reach statistical significance. Those who knew their blood pressure were 87% more likely to use CHC (OR = 1.87, 95% CI: 1.41-2.47). Higher household income was associated with lower likelihood of CHC use. Individuals who lived closer to the CHC (walking time  $\leq$  15 minutes) were 76% more likely to use CHC (OR=1.76, 95% CI: 1.19-2.62). Regarding need factors, adults who reported worse self-rated health or having regular physical activities were more likely to use CHC.

Table 2. Logistic regression model examining factors associated with the likelihood of using community health center

	OR	<i>p</i> value	95% CI
<b>Predisposing factors:</b>			
Age group:			
18-24	Reference		
25-34	0.86	0.565	[0.52 - 1.43]
35-44	0.67	0.148	[0.39 - 1.15]
45-54	0.65	0.131	[0.37 - 1.14]
55-64	1.00	0.991	[0.51 - 1.94]
65+	1.36	0.400	[0.66 - 2.81]
Female	1.39	<0.001	[1.20 - 1.62]
Marital status			

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3	Never married	Reference		
4	Married	2.79	<0.001	[1.72 - 4.50]
5	Divorced or widowed	3.01	0.001	[1.56 - 5.81]
6	Education, level			
7	No formal education	Reference		
8	Elementary school	1.79	0.008	[1.16 - 2.75]
9	Middle school	2.35	0.001	[1.45 - 3.81]
10	High or vocational school	1.49	0.146	[0.87 - 2.55]
11	College and above	1.48	0.216	[0.80 - 2.75]
12	Employment status			
13	Employed	Reference		
14	Retired	1.15	0.670	[0.60 - 2.19]
15	Not employed	1.05	0.727	[0.80 - 1.37]
16	Knowledge of one's body weight	0.79	0.548	[0.37 - 1.69]
17	Knowledge of one's blood pressure	1.87	<0.001	[1.41 - 2.47]
18	<b>Enabling factors:</b>			
19	Annual household per capita income (Yuan)			
20	≤4,999	Reference		
21	5,000-9,999	0.30	0.010	[0.12 - 0.75]
22	10,000-29,999	0.35	0.015	[0.15 - 0.82]
23	30,000-49,999	0.25	0.003	[0.10 - 0.61]
24	≥ 50,000	0.26	0.009	[0.10 - 0.71]
25	Has medical insurance	1.31	0.271	[0.81 - 2.10]
26	Walking time to the CHC ≤15 minutes	1.76	0.005	[1.19 - 2.62]
27	<b>Need factors:</b>			
28	Self-rated health			
29	Very good	Reference		
30	Good	1.41	0.027	[1.04 - 1.90]
31	Fair	1.78	0.008	[1.16 - 2.71]
32	Very poor	4.43	0.013	[1.36 - 14.35]
33	Number of chronic diseases			
34	0	Reference		
35	1	0.84	0.342	[0.59 - 1.20]
36	2 or more	1.16	0.644	[0.62 - 2.15]
37	Regular physical activities	1.35	0.033	[1.03 - 1.78]
38	Being sick in the two weeks prior to the survey	0.81	0.282	[0.56 - 1.18]
39	Hospitalized in prior year	0.78	0.160	[0.55 - 1.10]
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Table 3 describes the domain satisfaction as well as the overall satisfaction with the CHC among those who used CHC (n=1614). The great majority of CHC users were satisfied with various aspects of the CHC, with modest overall satisfaction scores of 3.87 (SD=0.49) on a 5-point scale. Respondents were slightly more satisfied with communication with providers (mean score of 3.92) and the perceived compassionate care (mean score of 3.96) and less satisfied with quality of medical equipment (mean score of 3.59). However, nine individuals were highly dissatisfied with the quality of medical equipment and one individual was highly dissatisfied with communication with providers.

Table 3. Satisfaction with the community health center among CHC users

Items	Mean <sup>†</sup> (SD)	Highly Dissatisfied # (%)	Dissatisfied # (%)	Neutral # (%)	Satisfied # (%)	Highly Satisfied # (%)
Technical ability of the staff	3.74 (0.59)	0	50 (3.1)	372 (23.1)	1134 (70.3)	57 (3.5)
Wait time	3.73 (0.52)	0	23 (1.4)	418 (25.9)	1139 (70.6)	33 (2.0)
Facilities	3.81 (0.49)	0	4 (0.2)	361 (22.4)	1181 (73.2)	67 (4.2)
Quality of medical equipment	3.59 (0.69)	9 (0.6)	103 (6.4)	483 (29.9)	960 (59.5)	58 (3.6)
Communication with the providers	3.92 (0.50)	1 (0.1)	12 (0.7)	227 (14.1)	1251 (77.6)	122 (7.6)
Perceived compassionate care	3.96 (0.49)	0	9 (0.6)	194 (12.0)	1259 (78.1)	151 (9.4)
Costs of care	3.87 (0.53)	0	27 (1.7)	269 (16.7)	1210 (75.0)	107 (6.6)
Overall	3.87 (0.49)	0	9 (0.6)	282 (17.5)	1230 (76.3)	92 (5.7)

<sup>†</sup> on a scale of 1 (highly dissatisfied) to 5 (highly satisfied)

## DISCUSSION

This study is the first to focus on the utilization of and satisfaction with CHC in a sample of adults living in a newly urbanized community in the 7<sup>th</sup> largest city in China. The findings indicate that predisposing, enabling and need factors all help explain the likelihood of CHC use among adults. There is some evidence suggesting that residents with low to modest education and income are more likely to use CHC whereas those with high education/income were less



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3 likely. Convenience factor (walking distance) plays an important role in determining realized  
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5 access to CHC.  
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9 The health consequences of rapid urbanization such as the increase of chronic diseases are  
10 more and more evident in China. For example, chronic diseases were estimated to contribute to  
11 80% of deaths and 70% of disability-adjusted life-years (DALYs) lost in China.<sup>36,37</sup> Urbanization  
12 among formerly suburban farming populations brings unique challenges in terms of increases in  
13 pollution, occupational hazards, exposure to known health risk factors such as diet that include  
14 more processed foods and more unhealthy food choices, and physical inactivity,<sup>9</sup> despite its  
15 positive effects in terms of better urban planning, housing, health services, and education.  
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17 Through health education, health promotion, and disease prevention services, CHCs could  
18 potentially be an important mechanism to counteract the detrimental effects of urbanization in  
19 these communities.  
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33 For individuals seeking health care information and services, CHCs are among a wide range  
34 of options ranging from standalone or pharmacy-affiliated private clinics to tertiary hospitals  
35 equipped with state-of-the-art diagnostic and treatment facilities. Despite the policy efforts to  
36 promote CHC use as the first choice for primary care, many residents in both urban and rural  
37 areas continue to rely heavily on tertiary hospitals.<sup>20,38</sup> The finding that 28.2% of study  
38 respondents did not use CHC in the last year suggests that there is still much room for  
39 improvement. Public health policy may need to continue promoting the role of CHC in enabling  
40 access to high quality primary care. Studies have shown that many residents may not be aware of  
41 services provided at CHC and there are large variations in awareness of CHC and its services  
42 among residents.<sup>7,28,39</sup> For example, a study in the southern city of Zhuhai showed that 38.4% of  
43 those surveyed were unaware of services provided by CHC<sup>40</sup> and another study of the eastern  
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3 province of Jiangsu found 25.1% of residents were unaware of their community CHC.<sup>41</sup> Second,  
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5 there is also evidence that some residents may not trust CHC as high quality health services  
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7 providers as compared to tertiary hospitals, which partially contributes to the crowding of those  
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9 hospitals.<sup>1,7</sup> Third, residents' knowledge about the importance of preventive care and health  
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11 promotion may not be adequate.<sup>7</sup> This is especially true for the newly urbanized residents, the  
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13 majority of whom were farmers not long before and they often lacked enough health literacy due  
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15 to poor socioeconomic status.<sup>42</sup> Therefore, it is important to promote health education among  
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17 community residents and to improve their knowledge of the health service functions of CHCs  
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19 and their importance in maintaining and improving health through regular visits to CHCs.  
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25 Understanding the factors affecting the use of CHCs is important in ensuring equal access to  
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27 CHCs among residents. This study adopted the Andersen model to identify what determines  
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29 CHC use among adults by categorizing associated factors as predisposing factors, enabling  
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31 factors, and need factors. Results revealed that the above three kinds of factors affected the  
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33 utilization of CHC among adults. Compared to males, a higher proportion of females had utilized  
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35 CHC in the past year. This finding is consistent with other related studies that found females to  
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37 be more likely to have contact with the healthcare system than males.<sup>10,43</sup> Some studies also  
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39 reported that education was associated with hospital or CHS choice.<sup>6,10</sup> In this study, we  
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41 observed a positive association between elementary and middle school education and CHC use  
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43 compared to those with no formal education. This study indicated that marital status was  
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45 significantly associated with CHC use and married and divorced or widowed adults were more  
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47 likely to utilize CHC as compared to never married adults. A similar result was found in  
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49 Blackwell's study that never-married adults in Canada were less likely to use hospitalization  
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51 compared to married adults.<sup>33</sup> In addition, we found that knowing about one's blood pressure had  
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3 a positive association with CHC use. While this may be due to better health awareness of  
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5 community health resources (such as the CHC) among people who check their blood pressures  
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7 regularly, we cannot rule out the possibility that those residents who used the CHC are more  
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9 likely to have their blood pressures checked due to the cross-sectional design of the study.  
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13 As an enabling factor, household income was found to have different effects on healthcare  
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15 utilization in previous studies. Recent studies have found that lower household income was the  
16  
17 consistent predictor of lower use of healthcare services.<sup>44-46</sup> In our study, household per capita  
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19 income was found to be negatively associated with CHC use in that adults with higher household  
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21 income were less likely to use CHC. In China, many residents with higher household income  
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23 may prefer to visit tertiary hospitals for common conditions due to perceived higher quality  
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25 associated with these hospitals.<sup>38</sup> Other reasons that may help explain low CHC utilization  
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27 include the lack of awareness of specific services provided by CHC, as well as the lack of trust  
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29 for CHC and its providers.<sup>1,7,10</sup> To improve the utilization of CHC, media campaigns make be  
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31 needed supplement reimbursement policy favoring CHC use for primary care.<sup>14</sup>  
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38 Previous studies showed that distance is an important determinant of health service demand  
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40 and can affect the utilization of health services.<sup>10,47</sup> Our finding that shorter walking time  
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42 (distance) was in fact associated with higher likelihood of CHC use. Results revealed, to some  
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44 extent, that site selection for future CHCs should consider geographic locations that maximize  
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46 convenience to as many residents as possible would promote CHC use. In addition, regular  
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48 physical activities were found to be associated with higher likelihood of CHC use among adults  
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50 in the current study. The explanation may be higher awareness of benefits of visiting a CHC  
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52 among those with regular physical activities. Somewhat unexpected, the number of chronic  
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3 conditions were not statistically significant predictors of CHC use. This may partially reflect the  
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5 under-utilization of CHC as a provider for chronic disease management and follow-up.  
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9 The results of satisfaction with the CHC revealed that the great majority of users were either  
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11 neutral or satisfied and the levels of satisfaction were quite modest across various aspects of the  
12  
13 CHC. While residents were slightly more satisfied with the communication with providers and  
14  
15 the perceived compassionate care, there were less satisfied with the quality of medical equipment  
16  
17 in the CHC. This finding suggests that the government may need to allocate additional resources  
18  
19 to improve the infrastructure and medical equipment, as well as the training and qualifications of  
20  
21 CHC providers. Evidence exists that partnerships between CHCs and tertiary hospitals may help  
22  
23 bridge the gap between providers' skills and efficiency and consumer demand for quality in  
24  
25 health care.<sup>16</sup>  
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30 This study has a number of limitations. The major limitation is the cross-sectional design  
31  
32 which precludes making causal inferences about the relationship between predictors and the  
33  
34 likelihood of CHC use. In addition, some predisposing factors such as health beliefs have not  
35  
36 been taken into consideration, which may also impact the utilization of health services. Finally,  
37  
38 while this study is among the first to examine access to CHC among recently-urbanized  
39  
40 populations in western China, the findings may not be generalizable to other regions in China.  
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## 45 CONCLUSIONS

46  
47 While important progress has been made in the development and strengthening of CHCs in  
48  
49 urban areas, and many community-dwelling adults are using CHCs, results of our investigation  
50  
51 suggest there is still room for improvement in the utilization of CHCs for primary care. The  
52  
53 majority of residents seemed to use the CHC to meet their care needs but more education and  
54  
55 consumer outreach programs are needed to further enhance the role of CHCs in promoting the  
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3 awareness of health information, health promotion, and behavior change in the communities  
4  
5 where people work and live. Satisfaction survey results suggest that more resources are needed  
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8 to strengthen the CHC infrastructure and staff competency. CHC participated health promotion  
9  
10 campaigns targeting at community residents may also be necessary to combat the negative  
11  
12 consequences of urbanization especially among large number of non-urban populations with  
13  
14 limited education but new found income/asset due to urban land development and substantial  
15  
16 appreciation in property price. Future studies should examine to what extent predisposing factors,  
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18 enabling factors and need factors can be modified to improve access to CHCs.  
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### Contributorship

Each of the authors contributed to the preparation and editing of the manuscript. DL, NL, XR, and BG designed the study, collected the data, and conducted the literature review. DL and HM analyzed the data and drafted the manuscript. DD, KC, and KH contributed to data interpretation and critical revisions of the manuscript.

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### Competing interests

None.

### Data Sharing Statement

No additional data are available.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1, 2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2, 3
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5-6
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-7
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8-9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-9
Bias	9	Describe any efforts to address potential sources of bias	9
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	9
		(b) Describe any methods used to examine subgroups and interactions	n/a
		(c) Explain how missing data were addressed	7
		(d) If applicable, describe analytical methods taking account of sampling strategy	n/a
		(e) Describe any sensitivity analyses	n/a
<b>Results</b>			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	7
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9
		(b) Indicate number of participants with missing data for each variable of interest	n/a
Outcome data	15*	Report numbers of outcome events or summary measures	9-10
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	12-14
		(b) Report category boundaries when continuous variables were categorized	12-14
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	n/a
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	14-15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	18
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	19
Generalisability	21	Discuss the generalisability (external validity) of the study results	18
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	20

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

# BMJ Open

## Cross-Sectional Study of Factors Associated with Community Health Center Use in a Recently-Urbanized Community in Chengdu, China

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Complete List of Authors:	Liu, Danping; Sichuan University, Department of Health and Social Behavior Meng, Hongdao; University of South Florida, School of Aging Studies Dobbs, Debra; University of South Florida, School of Aging Studies Conner, Kyaien; University of South Florida, Department of Mental Health Law & Policy Hyer, Kathryn; University of South Florida, School of Aging Studies Li, Ningxiu; Sichuan University, Department of Health and Social Behavior Ren, Xiaohui; Sichuan University, Department of Health and Social Behavior Gao, Bo; Sichuan University, Department of Health and Social Behavior
<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Epidemiology, Health services research
Keywords:	access, health behavior, health services, urbanization

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3 **Cross-Sectional Study of Factors Associated with Community Health Center Use in a**  
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5 **Recently-Urbanized Community in Chengdu, China**  
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9 Danping Liu, PhD, Department of Health and Social Behavior, School of Public Health, Sichuan  
10 University, Chengdu, China  
11

12 Hongdao Meng, PhD, School of Aging Studies, College of Behavioral and Community Sciences,  
13 University of South Florida, USA  
14 Telephone: 813-974-5504  
15 Fax: 813-974-9754  
16 Email: meng@usf.edu  
17  
18

19 Debra Dobbs, PhD, School of Aging Studies, College of Behavioral and Community Sciences,  
20 University of South Florida, USA  
21

22 Kyaaien O. Conner, PhD, LSW, MPH, Department of Mental Health Law & Policy  
23 University of South Florida, USA  
24

25 Kathryn Hyer, PhD, School of Aging Studies, College of Behavioral and Community Sciences,  
26 University of South Florida, USA  
27

28 Ningxiu Li, MD, Department of Health and Social Behavior, School of Public Health, Sichuan  
29 University, Chengdu, China  
30

31 Xiaohui Ren, PhD, Department of Health and Social Behavior, School of Public Health, Sichuan  
32 University, Chengdu, China  
33

34 Bo Gao, MD, Department of Health and Social Behavior, School of Public Health, Sichuan  
35 University, Chengdu, China  
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## Abstract

**Objectives:** Public investment in Community Health Centers (CHCs) has been increasing as a response to rapid urbanization in China. The objectives of this study were: 1) to examine factors associated with CHC use among residents from a recently-urbanized community in western China; and 2) to describe satisfaction with CHC among users.

**Design:** Cross-sectional design.

**Setting:** A community recently converted to urban status with a newly constructed CHC in Southwest China.

**Participants:** A random sample of 2,259 adults in the Hezuo community in Chengdu, China completed the survey in 2013.

**Outcome Measures:** Trained staff interviewed study participants in their homes using structured questionnaires. The survey included questions regarding socio-demographics, health status, access to and utilization of health care, health behaviors, and CHC utilization. The Andersen behavioral model of health service utilization was used to guide multivariable logistic regression modeling in identifying predisposing, enabling, and need factors associated with the likelihood of using CHC. Descriptive statistics were used to describe residents' satisfaction with the CHC.

**Results:** A total of 71.8% of the respondents reported using the CHC during the past year. Factors influencing adults' CHC use included: gender, marital status, education level, and knowledge of one's blood pressure (predisposing factors); annual household per capita income and walking time to the CHC (enabling factors); and self-rated health as well as physical activities (need factor). CHC users reported modest satisfaction across various aspects of the CHC.

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3 **Conclusions:** Neighborhood CHC in urban areas provide important services to these residents  
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5 living in a recently-urbanized community. All three categories of factors in the Andersen model  
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7 help explain the likelihood of CHC use. There is much room for improvement in CHC to  
8  
9 enhance customer satisfaction. Future research is needed to improve access to CHCs and  
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11 promote their use in urbanized populations with low to modest education.  
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15 **Keywords:** access to health care, health services, satisfaction, urbanization  
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## 18 19 20 **Article summary**

### 21 22 **Strengths and limitations of this study**

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24 This study used random household sampling to recruit a large community sample of adults who  
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26 live in a recently urbanized community with access to a newly established community health  
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28 center.  
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32 This is the first study to capture access to community health center in a transitioning urban  
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34 community with relatively low social-economic status from western China.  
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38 The study findings help policymakers understand why individuals use community health centers  
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40 and which aspects of care delivery can be improve to enhance user experience.  
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44 The cross-sectional study design limits the ability to correlational rather than causal inferences  
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46 regarding the relationship between individual characteristics and community health center use.  
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50 Self-reported health status measures are not as accurate as those based on physical examinations.  
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## INTRODUCTION

According to the Alma-Ata Declaration, access to primary care is crucial for attaining socially and economically productive lives.<sup>1</sup> To date, a large body of research indicates that access to primary care is one of the key metrics of measuring equity and efficiency in health care systems and it can reduce health disparities and avoidable hospitalizations as well as improve overall health status.<sup>2-5</sup> Community health services (CHS) is well established in developed countries such as the UK, the US, and Australia and it is considered one of the most important strategies for the development of primary health care in developing countries.<sup>6</sup> Community health centers (CHCs), mostly government operated, are the corner stone of China's Urban Health Care Reform as they are tasked with providing primary care and prevention to neighborhood residents.<sup>6,7</sup>

The economic reforms implemented since 1978 have brought rapid economic development and urbanization to China, with the urban population increasing from 191 million (1980) to 779 million in 2015.<sup>8,9</sup> But this unprecedented economic growth unfortunately was also associated with negative effects such as escalating medical costs and an increasing gap between the demand for and supply of effective health service, especially in primary care.<sup>10,11</sup> In addition, rapid population aging coincide with the changing profiles of disease burden from acute infectious and communicable diseases to chronic non-communicable diseases which in turn increase the demand for health services.<sup>12,13</sup> This mismatch between increasing demand and limited health care resources has also given rise to increased tensions between patients and medical care providers, with the occasional violent incidences reported by the media.<sup>14-16</sup> To address these problems, the Chinese State Council initiated a policy in 1997 declaring that China's health care in urban areas would focus on strengthening CHS. Since then, CHCs in



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3 China have become a critical component of the health care system and the Chinese government  
4 has strongly supported the establishment of CHCs. Further, it has designed the CHCs to act as  
5 the foundation and entry point for the health system. CHCs are responsible for routine primary  
6 care, physical rehabilitation, and public health practices (family planning and health  
7 education).<sup>6,7,17</sup> As a result, the number of community health facilities has increased dramatically  
8 from 8,211 to 33,736 between 2002 and 2012.<sup>6,17</sup>  
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18 The main goal of CHCs is to meet the basic health needs of every resident in the community.  
19 Thus, easy access to and satisfaction with CHC services are important benchmarks for policy-  
20 makers and health care administrators because they ensure the continuous development of CHCs.  
21 As urbanization of the Chinese population continues, demand for easy access to high quality  
22 primary care services in the community will remain elevated.<sup>18</sup> While CHCs have been identified  
23 as the preferred policy solution to meet this challenge,<sup>19,20</sup> few studies have utilized an  
24 empirically based behavioral model to examine the factors that influence CHC utilization.<sup>21-23</sup> In  
25 addition, there is a lack of research on recently urbanized populations, which has been a  
26 relatively new phenomenon, despite the initial evidence suggesting simultaneous improving and  
27 worsening health associated with urbanization in developing countries.<sup>9,24,25</sup> To address this gap  
28 in the literature, this study utilized the Andersen behavioral model of health service utilization to  
29 investigate factors associated with adult utilization of and satisfaction with CHCs in a newly-  
30 formed community with a mix of urban and newly urban residents.  
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49 The objectives of this study were: 1) to examine factors associated with CHC use among  
50 residents from a recently-urbanized community in western China; and 2) to describe satisfaction  
51 with CHC among users. To our knowledge, this study is among the first to examine access to a  
52 newly built CHC in a recently-urbanized community of a major city in western China, where the  
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3 pace of economic development has historically lagged behind the more affluent eastern part of  
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5 the country.  
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## 8 9 **METHODS**

### 10 11 **Study Setting**

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14 This study used a cross-sectional research design and was conducted in the Hezuo  
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16 community, one of six sub-districts within a recently developed urban district in Chengdu,  
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18 Sichuan from January to June in 2013. Chengdu is the capital of Sichuan province in Southwest  
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20 China and ranked 7<sup>th</sup> most populous metropolitan area city in China with 14 million residents as  
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22 of 2010.<sup>26</sup>  
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26 CHS was developed in Chengdu in the late 1990s. In 2008, the city was selected as one of  
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28 28 major cities for the “The National Urban Community Health Service System Building  
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30 Project” by the Ministry of Health of China. The nationwide project was aimed at pilot testing of  
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32 CHS systems and accumulating evidence-based recommendations for further CHS  
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34 development.<sup>16</sup> The CHS system in Chengdu consisted of 64 CHCs located in six urban districts.  
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36 Hezuo community (Gaoxin District, population 51,389 as of 2012) was chosen for the study  
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38 because it began the rural-to-urban conversion process in 2006. Prior to the conversion, virtually  
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40 all residents were farmers and the conversion process is still ongoing. Hezuo CHC, a newly  
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42 constructed facilitate opened to the community residents for service in 2007, is staffed by 66 full-  
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44 time health care professionals, including 17 licensed physicians in primary care, ten licensed  
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46 physician in traditional Chinese medicine, 28 registered nurses, 10 medical technologists, and a  
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48 contracted supporting staff. Besides the CHC, there are three other hospitals and seven private  
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50 clinics in the community.  
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### 56 57 **Study participants**

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3 All adult residents aged 18 and older who resided in Hezuo community for at least 6 months  
4 at the time of the survey were eligible to participate in this study. A sample size of 1000  
5 households was determined based on published community health assessment guidelines.<sup>27,28</sup> A  
6 three-stage sampling process was used to ensure the sample is representative of all residents. In  
7 the first stage, all housing developments (similar to the Homeowners Association in the U.S.)  
8 from the six neighborhood committees in Hezuo Sub-District were stratified into government-  
9 sponsored housing developments (as part of the urbanization land development) and commercial  
10 developments (typically higher priced). In stage 2, building units were randomly sampled from  
11 the specific housing developments in stage 1. Computer-generated random numbers were used to  
12 determine specific housing developments (stage 1) and building units (stage 2). Finally,  
13 systematic random sampling were used to select even or odd number of building units from those  
14 identified in stage 2. During the visits to respondents' homes, we first explained the aims of the  
15 study to an adult from each household. After obtaining informed consent, each participant was  
16 interviewed by trained staff (medical and public health students, and community volunteers). The  
17 interviews took an average of 20 minutes to complete and each participant received a small gift  
18 (worth 10-15 Yuan) as a token of appreciation at the end of the interview. A total of 1,008  
19 households agreed to participate in the survey and 2,259 adults out of a total of 2653 adults in  
20 these households returned questionnaires (a response rate of 85.1%). Questionnaires were  
21 checked after the interviews for completeness. Twelve records were excluded from the analysis  
22 due to missing information on CHC use. The study protocol was approved by the Sichuan  
23 University Institutional Review Board.

## 54 Measures

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The questionnaire was adapted from a number of structured household surveys on community health assessment.<sup>27,29</sup> The survey included the following domains of questions: 1) socio-demographics (age, gender, marital status, residence registration, insurance, income, education, occupation); 2) health status and health behaviors (the number of physician diagnosed common chronic conditions, diet and physical activity); 3) access to care (care-seeking behavior, location of care, type of provider, past year hospital use and health care expenditures); and 4) CHC awareness and utilization. CHC utilization was operationalized as an affirmative response to the question: “in the past year, have you used the Hezuo CHC for any of the following: physician office visit, physical examination, health information or education?” Among respondents who have used the CHC, they were then asked about their satisfaction with various aspects of care, including staff technical expertise, wait-time, quality of the facility, quality of the medical equipment, physician-patient communication skills, cost of care, and overall satisfaction with the CHC. A 5-point Likert scale ranging from “Highly dissatisfied (1)” to “Highly satisfied (5)” was used for all satisfaction questions.

This study adopted the Andersen Behavioral Model of Health Services Utilization to examine the factors associated with the utilization of CHS.<sup>30,31</sup> According to this model, factors contributing to health service use can be classified in three domains: predisposing, enabling, and need. Predisposing factors comprise socio-demographic characteristics and psychosocial characteristics.<sup>32</sup> Enabling factors present means or opportunities to access needed health services. Need factors reflect the experience of symptoms or illness that lead an individual to think that seeking health service is necessary.<sup>33</sup> In this survey, measures of predisposing factors included age, gender, marital status, education level, employment status, knowledge of one’s body weight, and knowledge of one’s blood pressure. Enabling factors included annual

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3 household per capita income, medical insurance, and walking time from home to the nearest  
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5 CHC. Measures of need factors included self-rated health, regular physical activities, number of  
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7 chronic diseases, any acute illness in the two weeks prior to the survey, and hospitalization in the  
8  
9 previous year.  
10

### 11 12 13 **Statistical Analysis**

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15 All research data were entered into EpiData 3.1 for initial processing (validity check, quality  
16  
17 control, and verification).<sup>34</sup> Statistical analyses were conducted using the IBM SPSS (version  
18  
19 23.0. Armonk, NY: IBM Corp.). We first presented individual characteristics of the sample as a  
20  
21 whole and then by CHC use status (non-users versus users). We reported means and standard  
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23 deviations (SD) as descriptive statistics for continuous variables and percentages (%) for  
24  
25 categorical variables. Pearson's Chi-squared tests were used to examine differences for  
26  
27 categorical variables, and t-tests were used to examine differences for continuous variables. We  
28  
29 then estimated binary logistic regression models to examine the relationship between the  
30  
31 independent variables (predisposing factors, enabling factors, and need factors) and the  
32  
33 likelihood of CHC use. We adjusted the standard errors for clustering of individuals in  
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35 households to allow for intra-family correlation.<sup>35</sup> Results with a p value of <0.05 were  
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37 considered statistically significant.  
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## 45 **RESULTS**

### 46 47 **Sample Characteristics**

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49 Individual characteristics of the sample and differences in these characteristics between  
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51 CHC users and non-users are shown in Table 1. The mean age of the study sample was 46.8  
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53 years (SD=17.0, range: 18-98) and 52.6% were female. The majority of respondents were  
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3 married (82.2%) and only 26.7% had more than nine years of formal education. While an  
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6 overwhelming majority (96.3%) were aware of their body weight, less than two-thirds (70.2%)  
7  
8 knew their recent blood pressure measures. Regarding the enabling factors, only 5.9% of the  
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10 sample had annual per capita income of 50,000 Yuan but most (94.4%) had medical insurance.  
11  
12 Finally, the need factors showed that 22.6% of the participants had at least one chronic disease,  
13  
14 14.1% had being sick in the two weeks prior to the survey and 16.7% had been hospitalized in  
15  
16 the previous year. Overall, 1,613 (71.8%) used the CHC in the year before the survey. The  
17  
18 comparisons between CHC users and non-users showed that they were different in almost all  
19  
20 predisposing (age, gender, marital status, education level, employment status, and knowledge of  
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22 one's blood pressure), enabling (annual household per capita income, medical insurance and  
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24 walking time from home to the nearest CHC) and need factors (self-rated health, regular physical  
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26 activities, number of chronic diseases, illness in the two weeks before the survey, and  
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28 hospitalization in prior year). The exception to this was body weight awareness ( $p=0.862$ ).  
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35 Table 1. Sample characteristics by community health center utilization status

37	38	39	40	41	42
Factors	Total (n=2247)	Non-users (n=634)	Users (n=1613)	<i>p</i> value	
<b>Predisposing factors:</b>					
Age, mean (SD)	46.8(17.0)	41.9(15.9)	48.8(17.1)	<0.001	
Age group (%)				<0.001	
18-24	8.8	13.4	7.0		
25-34	19.1	22.7	17.7		
35-44	20.9	25.1	19.3		
45-54	16.6	17.4	16.2		
55-64	16.1	11.7	17.8		
65+	18.6	9.8	22.0		
Gender (%)				<0.001	
Male	47.4	54.6	44.5		
Female	52.6	45.4	55.5		
Marital status (%)				<0.001	

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3	Never married	9.3	17.8	6.0	
4	Married	82.2	76.7	84.4	
5	Divorced or widowed	8.4	5.5	9.5	
6					
7	Education level (%)				<0.001
8	No formal education	9.6	8.7	10.0	
9	Elementary school	29.7	23.3	32.2	
10	Middle school	34.0	31.4	35.0	
11	High or vocational school	16.3	21.1	14.4	
12	College and above	10.4	15.5	8.4	
13	Employment status (%)				<0.001
14	Currently employed	50.4	61.4	46.1	
15	Retired	6.5	3.9	7.4	
16	Not employed	43.1	34.6	46.5	
17	Aware of body weight (%)	96.3	96.4	96.2	0.862
18	Aware of blood pressure level (%)	70.2	58.2	74.9	<0.001
19					
20	<b>Enabling factors:</b>				
21	Annual household per capita income (Yuan) (%)				0.001
22	≤4,999	3.3	1.6	4.0	
23	5,000-9,999	15.0	15.5	14.9	
24	10,000-29,999	63.3	60.3	64.5	
25	30,000-49,999	12.5	15.6	11.3	
26	≥ 50,000	5.9	7.1	5.4	
27	Has medical insurance (%)	94.4	92.1	95.4	0.004
28	Walking time from home to the CHC (%)				0.029
29	≤15 minutes	86.3	83.8	87.4	
30	>15 minutes	13.7	16.2	12.6	
31					
32	<b>Need factors:</b>				
33	Self-rated health				<0.001
34	Very poor or poor	2.5	0.6	3.3	
35	Fair	18.6	11.8	21.2	
36	Good	45.4	43.0	46.3	
37	Very good	33.5	44.5	29.1	
38	Number of chronic diseases (%)				<0.001
39	0	77.4	84.9	74.5	
40	1	16.3	12.5	17.8	
41	2 or more	6.3	2.7	7.7	
42	Regular physical activities (%)	53.2	45.1	56.4	<0.001
43	Being sick in the two weeks prior to the survey	14.1	10.3	15.6	0.001
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(%)				
Hospitalized in prior year (%)	16.7	10.1	19.3	<0.001

Table 2 shows the results of the multivariable logistic regression model predicting the likelihood of CHC use. Four predisposing factors (female, marital status, education level, knowledge of one's blood pressure), two enabling factors (per capita annual household income and walking time to the nearest CHC under 15 minutes) and two need factor (self-rated health and regular physical activities) had a significant independent effect on the likelihood CHC use. Women were 39% more likely than men to have used CHC (OR = 1.39, 95% CI: 1.20-1.62). Compared with never married adults, married/divorced/widowed adults were much more likely to use CHC. Both elementary school education and middle school education had significant positive effects on adults using CHC as compared to those with no formal education, however, the effect of additional education beyond middle school did not reach statistical significance. Those who knew their blood pressure were 87% more likely to use CHC (OR = 1.87, 95% CI: 1.41-2.47). Higher household income was associated with lower likelihood of CHC use. Individuals who lived closer to the CHC (walking time  $\leq$  15 minutes) were 76% more likely to use CHC (OR=1.76, 95% CI: 1.19-2.62). Regarding need factors, adults who reported worse self-rated health or having regular physical activities were more likely to use CHC.

Table 2. Multivariable logistic regression model examining factors associated with the likelihood of using community health center

	OR†	p value	95% CI
<b>Predisposing factors:</b>			
Age group:			
18-24	Reference		
25-34	0.86	0.565	[0.52 - 1.43]
35-44	0.67	0.148	[0.39 - 1.15]
45-54	0.65	0.131	[0.37 - 1.14]
55-64	1.00	0.991	[0.51 - 1.94]



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3	65+	1.36	0.400	[0.66 - 2.81]
4	Female	1.39	<0.001	[1.20 - 1.62]
5	Marital status			
6	Never married	Reference		
7	Married	2.79	<0.001	[1.72 - 4.50]
8	Divorced or widowed	3.01	0.001	[1.56 - 5.81]
9	Education, level			
10	No formal education	Reference		
11	Elementary school	1.79	0.008	[1.16 - 2.75]
12	Middle school	2.35	0.001	[1.45 - 3.81]
13	High or vocational school	1.49	0.146	[0.87 - 2.55]
14	College and above	1.48	0.216	[0.80 - 2.75]
15	Employment status			
16	Employed	Reference		
17	Retired	1.15	0.670	[0.60 - 2.19]
18	Not employed	1.05	0.727	[0.80 - 1.37]
19	Knowledge of one's body weight	0.79	0.548	[0.37 - 1.69]
20	Knowledge of one's blood pressure	1.87	<0.001	[1.41 - 2.47]
21	<b>Enabling factors:</b>			
22	Annual household per capita income (Yuan)			
23	≤4,999	Reference		
24	5,000-9,999	0.30	0.010	[0.12 - 0.75]
25	10,000-29,999	0.35	0.015	[0.15 - 0.82]
26	30,000-49,999	0.25	0.003	[0.10 - 0.61]
27	≥ 50,000	0.26	0.009	[0.10 - 0.71]
28	Has medical insurance	1.31	0.271	[0.81 - 2.10]
29	Walking time to the CHC ≤15 minutes	1.76	0.005	[1.19 - 2.62]
30	<b>Need factors:</b>			
31	Self-rated health			
32	Very good	Reference		
33	Good	1.41	0.027	[1.04 - 1.90]
34	Fair	1.78	0.008	[1.16 - 2.71]
35	Very poor	4.43	0.013	[1.36 - 14.35]
36	Number of chronic diseases			
37	0	Reference		
38	1	0.84	0.342	[0.59 - 1.20]
39	2 or more	1.16	0.644	[0.62 - 2.15]
40	Regular physical activities	1.35	0.033	[1.03 - 1.78]
41	Being sick in the two weeks prior to the survey	0.81	0.282	[0.56 - 1.18]
42	Hospitalized in prior year	0.78	0.160	[0.55 - 1.10]

†: Adjusted for all covariates listed.

Table 3 describes the domain satisfaction as well as the overall satisfaction with the CHC among those who used CHC (n=1614). The great majority of CHC users were satisfied with various aspects of the CHC, with modest overall satisfaction scores of 3.87 (SD=0.49) on a 5-point scale. Respondents were slightly more satisfied with communication with providers (mean score of 3.92) and the perceived compassionate care (mean score of 3.96) and less satisfied with quality of medical equipment (mean score of 3.59). However, nine individuals were highly dissatisfied with the quality of medical equipment and one individual was highly dissatisfied with communication with providers.

Table 3. Satisfaction with the community health center among CHC users

Items	Mean <sup>†</sup> (SD)	Highly Dissatisfied # (%)	Dissatisfied # (%)	Neutral # (%)	Satisfied # (%)	Highly Satisfied # (%)
Technical ability of the staff	3.74 (0.59)	0	50 (3.1)	372 (23.1)	1134 (70.3)	57 (3.5)
Wait time	3.73 (0.52)	0	23 (1.4)	418 (25.9)	1139 (70.6)	33 (2.0)
Facilities	3.81 (0.49)	0	4 (0.2)	361 (22.4)	1181 (73.2)	67 (4.2)
Quality of medical equipment	3.59 (0.69)	9 (0.6)	103 (6.4)	483 (29.9)	960 (59.5)	58 (3.6)
Communication with the providers	3.92 (0.50)	1 (0.1)	12 (0.7)	227 (14.1)	1251 (77.6)	122 (7.6)
Perceived compassionate care	3.96 (0.49)	0	9 (0.6)	194 (12.0)	1259 (78.1)	151 (9.4)
Costs of care	3.87 (0.53)	0	27 (1.7)	269 (16.7)	1210 (75.0)	107 (6.6)
Overall	3.87 (0.49)	0	9 (0.6)	282 (17.5)	1230 (76.3)	92 (5.7)

<sup>†</sup> on a scale of 1 (highly dissatisfied) to 5 (highly satisfied)

## DISCUSSION

This study is the first to focus on the utilization of and satisfaction with CHC in a sample of adults living in a newly urbanized community in the 7<sup>th</sup> largest city in China. The findings indicate that predisposing, enabling and need factors all help explain the likelihood of CHC use among adults. There is some evidence suggesting that residents with low to modest education and income are more likely to use CHC whereas those with high education/income were less

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3 likely. Convenience factor (walking distance) plays an important role in determining realized  
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5 access to CHC.  
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9 The health consequences of rapid urbanization such as the increase of chronic diseases are  
10 more and more evident in China. For example, chronic diseases were estimated to contribute to  
11 80% of deaths and 70% of disability-adjusted life-years (DALYs) lost in China.<sup>36,37</sup> Urbanization  
12 among formerly suburban farming populations brings unique challenges in terms of increases in  
13 pollution, occupational hazards, exposure to known health risk factors such as diet that include  
14 more processed foods and more unhealthy food choices, and physical inactivity,<sup>9</sup> despite its  
15 positive effects in terms of better urban planning, housing, health services, and education.  
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17 Through health education, health promotion, and disease prevention services, CHCs could  
18 potentially be an important mechanism to counteract the detrimental effects of urbanization in  
19 these communities.  
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33 For individuals seeking health care information and services, CHCs are among a wide range  
34 of options ranging from standalone or pharmacy-affiliated private clinics to tertiary hospitals  
35 equipped with state-of-the-art diagnostic and treatment facilities. Despite the policy efforts to  
36 promote CHC use as the first choice for primary care, many residents in both urban and rural  
37 areas continue to rely heavily on tertiary hospitals.<sup>20,38</sup> The finding that 28.2% of study  
38 respondents did not use CHC in the last year suggests that there is still much room for  
39 improvement. Public health policy may need to continue promoting the role of CHC in enabling  
40 access to high quality primary care. Studies have shown that many residents may not be aware of  
41 services provided at CHC and there are large variations in awareness of CHC and its services  
42 among residents.<sup>7,28,39</sup> For example, a study in the southern city of Zhuhai showed that 38.4% of  
43 those surveyed were unaware of services provided by CHC<sup>40</sup> and another study of the eastern  
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3 province of Jiangsu found 25.1% of residents were unaware of their community CHC.<sup>41</sup> Second,  
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5 there is also evidence that some residents may not trust CHC as high quality health services  
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7 providers as compared to tertiary hospitals, which partially contributes to the crowding of those  
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9 hospitals.<sup>1,7</sup> Third, residents' knowledge about the importance of preventive care and health  
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11 promotion may not be adequate.<sup>7</sup> This is especially true for the newly urbanized residents, the  
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13 majority of whom were farmers not long before and they often lacked enough health literacy due  
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15 to poor socioeconomic status.<sup>42</sup> Therefore, it is important to promote health education among  
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17 community residents and to improve their knowledge of the health service functions of CHCs  
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19 and their importance in maintaining and improving health through regular visits to CHCs.  
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25 Understanding the factors affecting the use of CHCs is important in ensuring equal access to  
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27 CHCs among residents. This study adopted the Andersen model to identify what determines  
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29 CHC use among adults by categorizing associated factors as predisposing factors, enabling  
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31 factors, and need factors. Results revealed that the above three kinds of factors affected the  
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33 utilization of CHC among adults. Compared to males, a higher proportion of females had utilized  
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35 CHC in the past year. This finding is consistent with other related studies that found females to  
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37 be more likely to have contact with the healthcare system than males.<sup>10,43</sup> Some studies also  
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39 reported that education was associated with hospital or CHS choice.<sup>6,10</sup> In this study, we  
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41 observed a positive association between elementary and middle school education and CHC use  
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43 compared to those with no formal education. This study indicated that marital status was  
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45 significantly associated with CHC use and married and divorced or widowed adults were more  
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47 likely to utilize CHC as compared to never married adults. A similar result was found in  
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49 Blackwell's study that never-married adults in Canada were less likely to use hospitalization  
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51 compared to married adults.<sup>33</sup> In addition, we found that knowing about one's blood pressure had  
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3 a positive association with CHC use. While this may be due to better health awareness of  
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5 community health resources (such as the CHC) among people who check their blood pressures  
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7 regularly, we cannot rule out the possibility that those residents who used the CHC are more  
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9 likely to have their blood pressures checked due to the cross-sectional design of the study.  
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13 As an enabling factor, household income was found to have different effects on healthcare  
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15 utilization in previous studies. Recent studies have found that lower household income was the  
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17 consistent predictor of lower use of healthcare services.<sup>44-46</sup> In our study, household per capita  
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19 income was found to be negatively associated with CHC use in that adults with higher household  
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21 income were less likely to use CHC. In China, many residents with higher household income  
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23 may prefer to visit tertiary hospitals for common conditions due to perceived higher quality  
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25 associated with these hospitals.<sup>38</sup> Other reasons that may help explain low CHC utilization  
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27 include the lack of awareness of specific services provided by CHC, as well as the lack of trust  
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29 for CHC and its providers.<sup>1,7,10</sup> To improve the utilization of CHC, media campaigns make be  
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31 needed supplement reimbursement policy favoring CHC use for primary care.<sup>14</sup>  
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38 Previous studies showed that distance is an important determinant of health service demand  
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40 and can affect the utilization of health services.<sup>10,47</sup> Our finding that shorter walking time  
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42 (distance) was in fact associated with higher likelihood of CHC use. Results revealed, to some  
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44 extent, that site selection for future CHCs should consider geographic locations that maximize  
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46 convenience to as many residents as possible would promote CHC use. In addition, regular  
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48 physical activities were found to be associated with higher likelihood of CHC use among adults  
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50 in the current study. The explanation may be higher awareness of benefits of visiting a CHC  
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52 among those with regular physical activities. Somewhat unexpected, the number of chronic  
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3 conditions were not statistically significant predictors of CHC use. This may partially reflect the  
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5 under-utilization of CHC as a provider for chronic disease management and follow-up.  
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9 The results of satisfaction with the CHC revealed that the great majority of users were either  
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11 neutral or satisfied and the levels of satisfaction were quite modest across various aspects of the  
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13 CHC. While residents were slightly more satisfied with the communication with providers and  
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15 the perceived compassionate care, there were less satisfied with the quality of medical equipment  
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17 in the CHC. This finding suggests that the government may need to allocate additional resources  
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19 to improve the infrastructure and medical equipment, as well as the training and qualifications of  
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21 CHC providers. Evidence exists that partnerships between CHCs and tertiary hospitals may help  
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23 bridge the gap between providers' skills and efficiency and consumer demand for quality in  
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25 health care.<sup>16</sup>  
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31 This study has a number of limitations. The major limitation is the cross-sectional design  
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33 which precludes making causal inferences about the relationship between predictors and the  
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35 likelihood of CHC use. In addition, some predisposing factors such as health beliefs have not  
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37 been taken into consideration, which may also impact the utilization of health services. Finally,  
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39 while this study is among the first to examine access to CHC among recently-urbanized  
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41 populations in western China, the findings may not be generalizable to other regions in China.  
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## 45 CONCLUSIONS

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47 While important progress has been made in the development and strengthening of CHCs in  
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49 urban areas, and many community-dwelling adults are using CHCs, results of our investigation  
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51 suggest there is still room for improvement in the utilization of CHCs for primary care. The  
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53 majority of residents seemed to use the CHC to meet their care needs but more education and  
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55 consumer outreach programs are needed to further enhance the role of CHCs in promoting the  
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3 awareness of health information, health promotion, and behavior change in the communities  
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5 where people work and live. Satisfaction survey results suggest that more resources are needed  
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8 to strengthen the CHC infrastructure and staff competency. CHC participated health promotion  
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10 campaigns targeting at community residents may also be necessary to combat the negative  
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12 consequences of urbanization especially among large number of non-urban populations with  
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14 limited education but new found income/asset due to urban land development and substantial  
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16 appreciation in property price. Future studies should examine to what extent predisposing factors,  
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18 enabling factors and need factors can be modified to improve access to CHCs.  
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### Contributorship

Each of the authors contributed to the preparation and editing of the manuscript. DL, NL, XR, and BG designed the study, collected the data, and conducted the literature review. DL and HM analyzed the data and drafted the manuscript. DD, KC, and KH contributed to data interpretation and critical revisions of the manuscript.

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### Competing interests

None.

### Data Sharing Statement

No additional data are available.



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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1, 2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2, 3
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5-6
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-7
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8-9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-9
Bias	9	Describe any efforts to address potential sources of bias	9
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	9
		(b) Describe any methods used to examine subgroups and interactions	n/a
		(c) Explain how missing data were addressed	7
		(d) If applicable, describe analytical methods taking account of sampling strategy	n/a
		(e) Describe any sensitivity analyses	n/a
<b>Results</b>			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	7
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9
		(b) Indicate number of participants with missing data for each variable of interest	n/a
Outcome data	15*	Report numbers of outcome events or summary measures	9-10
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	12-14
		(b) Report category boundaries when continuous variables were categorized	12-14
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	n/a
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	14-15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	18
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	19
Generalisability	21	Discuss the generalisability (external validity) of the study results	18
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	20

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

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