PUBLIC HEALTH 171 (2019) 41–49

Available online at www.sciencedirect.com

Public Health

journal homepage: www.elsevier.com/puhe

Original Research

Patient-centered care factors and access to care: a path analysis using the Andersen behavior model

YR. Hong [a,], S.K. Samuels [b], JH. Huo [a], N. Lee [c], H. Mansoor [a], R.P. Duncan [a]*

[a] *Department of Health Services Research, Management and Policy, College of Public Health and Health Professions, University of Florida, Gainesville, FL, USA*

[b] *Office of Human Research, Memorial Healthcare System, Hollywood, FL, USA*

[c] *Department of Behavioral Science and Community Health, College of Public Health and Health Professions, University of Florida, Gainesville, FL, USA*

ARTICLE INFO

Article history:
Received 20 November 2018
Received in revised form
19 March 2019
Accepted 29 March 2019
Available online 13 May 2019

Keywords:
Access to care
Patient-centered care
Quality of health services
Andersen health behavioral model
Structural equation modeling

ABSTRACT

Objectives: Using the Andersen behavioral model, we examined the complex relationships among geographic access to care, financial disadvantage, patient-centered care factors, and access to care outcomes.

Study design: This was a retrospective, cross-sectional study of the US civilian non-institutionalized population.

Methods: Our analytic sample included 15,787 US adults aged 18 years or older who had health insurance coverage for a full year in Medical Expenditure Panel Survey 2014–2015. Structural equation modeling was used to determine the associations among usual source of care, travel time to provider, financial disadvantage, patient-centered care factors (perceived interaction with health provider, shared decision-making, and value of health care), and access to care (perceived access to care and unmet need of health services).

Results: Our analysis showed that patient-centered care factors were associated with improved perceived access to care ($\beta = 0.03$ to 0.56, $P = .002$) and reduced unmet needs of health care ($\beta = -0.03$ to -0.17, $P = .03$ to $< .001$). Although longer travel time to provider and having financial disadvantage of paying medical bills had negative effects on access to care outcomes, these associations were mediated by patient-centered care quality factors.

Conclusions: Our findings suggest that better patient-centered care factors are associated with enhanced patient access to care. Efforts that focus on improving patient experience could be an effective approach along with coverage expansion to enhance access to quality care.

---

* *Corresponding author*. Health Services Research, Management and Policy College of Public Health and Health Professions 1225 Center Drive, HPNP 3118, University of Florida Gainesville, FL, 32611, USA. Tel.: +352 273 6074; fax: +352 273 6075.

E-mail address: youngrock.h@phhp.ufl.edu (YR. Hong).

https://doi.org/10.1016/j.puhe.2019.03.020

Introduction

Health insurance is a well-established factor that helps facilitate access to health care by protecting patients and their families against the financial burden of medical care.[1–3] With almost 50 million individuals uninsured in 2010, the lack of adequate insurance coverage has been implicated in the poor health outcomes of various populations.[4,5] Since the implementation of Patient Protection and Affordable Care Act (ACA), the number of uninsured Americans has substantially decreased from 16% in 2010 to 8.8% in 2018.[5,6] Early evidence has also indicated that the provisions of the ACA were associated with improved access to quality health services[7,8] and decreased out-of-pocket spending.[9]

Although the ACA's coverage expansion was found to be a significant factor for these success,[8,10–12] it appears that considerable disparities in access to care still exist, even among those with health insurance.[13–15] A recent study has demonstrated that there was no meaningful improvement in utilization of routine checkup and usual source of care (USC) provider among those with chronic conditions after Medicaid expansion.[15] Another study has also reported that the use of preventive care services subject to no-cost sharing among the privately insured population differed across the socio-economic status.[13] These studies suggest that having health insurance may not guarantee the use of needed health services, and there may be unobserved factors related to access to care, other than health insurance.

As the US healthcare continues to find ways to improve patient access and to provide value- or quality-based care,[16] it is essential to explore and examine the other factors that are associated with improved access to care beyond health insurance. Using the Andersen health behavioral model as the theoretical framework, in this study, we sought to explore the multifaceted nature of access to care by examining patient geographic accessibility, financial disadvantage, patient-centered care factors among individuals with health insurance in the US.

Model development and hypotheses

The Andersen health behavioral model is a comprehensive and complex framework that has been implemented in a wide range of contexts with various types of health outcome measures and populations.[17–19] The model has suggested that the use of health services is influenced by three recognized factors: predisposing, enabling, and need factors.[18,19] Predisposing factors, such as demographic, socio-economic characteristics, and other psychological factors (e.g., belief, attitude, and value), refer to an individual's propensity to seek care that could predispose to use of health care. Enabling factors are resources that serve as facilitators in seeking care, including community resources (e.g., availability of health providers and transportation), geographical access (e.g., travel time), and personal resources (e.g., having health insurance, USC, and one's ability to pay for health care). Need factors describe how an individual perceives his/her health status and determine the need for health care. Health providers' evaluation of health status and related medical care is also included in need factors.

For this study, we adapted the Andersen model to assess the effects of patient-centered care factors on access to care both directly and indirectly. We incorporated perceived interaction quality with providers, shared decision-making, and value of health care as intermediate factors in the model. With the current movement toward value- or quality-based care, growing evidence sheds important light on patient-centered experience/outcomes and quality of health services.[19–24] Hence, it is reasonable to posit that factors related to quality attributes of health services, such as interaction with health providers or satisfaction with care received may be related to access to care (e.g., revisit to care or continuity of care) among those having access-enabling resources. Moreover, active participation and involvement of patients and their family members in all phases of healthcare decision-making process can improve the quality of care and ensure that the care is aligned with patients' value.[25,26] Therefore, we primarily hypothesized that perceived interaction quality with health providers,[19–24] perceived shared decision-making,[25,26] and perceived value of health care[22] would positively affect access to care among those with health insurance. Given negative associations suggested by the literature, we also hypothesized that travel time to provider (as a proxy of geographic access);[19,27,28] and financial disadvantage of paying medical bill[27–29] would be negatively associated with access to care. Lastly, it was hypothesized that those negative relationships would be mediated by the patient-centered quality of care factors.[19,23,25] Fig. 1 presents the conceptual framework of the study model.

Methods

Data and study population

We used data from the 2014–2015 Medical Expenditure Panel Survey (MEPS). The MEPS is an annual nationally representative survey of the US civilian non-institutionalized population that provides health service utilization, expenditures, sources of payment, health insurance coverage, and patient experience with health care.[30,31] We included US adults aged 18 years or older who had health insurance coverage for a full year. Table 1 presents descriptive statistics of the sample ($N = 15{,}787$).

Measures

We executed an initial exploratory factor analysis, using principal component factoring with Varimax rotation, to see whether hypothesized five factors emerged: (1) perceived interaction quality with health provider, (2) shared decision-making, (3) perceived value of health care, (4) perceived access to care, and (5) unmet need of health services. Items loaded onto the intended factors from the Varimax rotation (orthogonal) were verified using Promax form of oblique rotation.[32] Then, Cronbach's alpha was calculated to assess the reliability of each factor, and acceptable internal

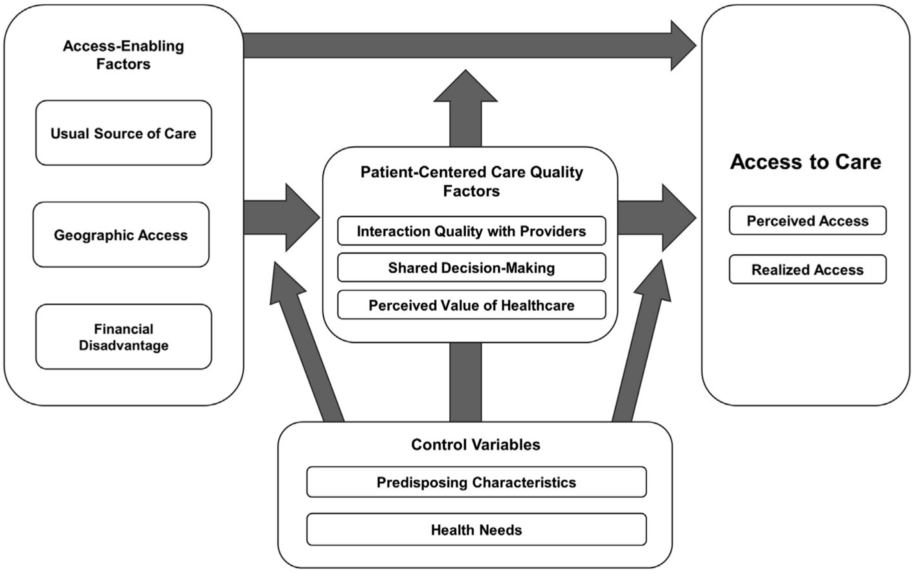


Fig. 1 – Conceptual model for evaluating effects of access-enabling and patient-centered care quality factors on access to care.

consistency reliability was evident for perceived interaction quality with health provider ($\alpha = .795$), shared decision-making ($\alpha = .613$), perceived value of health care ($\alpha = .704$), perceived access to care ($\alpha = .755$), and unmet need of health services ($\alpha = .658$). Table 2 presents descriptive statistics of patient-centered quality factors and access to care outcomes with rotated factor loadings.

Access-enabling factors

Enabling factors included three items: having a USC, geographic access, and financial disadvantage. Respondents reported they had a particular medical provider that they usually go to when seeking care. Geographic access was measured with patient travel time to providers. Response options included <15 min, 15–30 min, 31–60 min, 61–90 min, 91–120 min, and >120 min. Financial disadvantage was assessed by one question asking if a respondent or a family member had problems paying or were unable to pay medical bills in the past 12 months.

Patient-centered care factors

Perceived interaction quality with health provider was assessed by using six items from adult self-administered questionnaire (SAQ). SAQ is a subset of the MEPS that includes questions from the Consumer Assessment of Healthcare Providers and Systems Survey (CAHPS®).[30] The six items we included were in the last 12 months, how often did your doctor or other health providers (1) explain things in a way that was easy to understand, (2) listen carefully to you, (3) show respect for what you had to say, and (4) spend enough time with you and (5) the advice given by doctors or other health providers was easy to understand and (6) overall rating of received care in the past year. Responses were scored using a Likert scale ranging from 1 (never) to 4 (always) with higher scores indicating better quality of interaction with health provider.

Shared decision-making was assessed with two items asking in the last 12 months, did your provider (1) ask to help make decisions between choices of treatment and (2) ask about and show respect for medical, traditional, and alternative treatments that you were happy with. Responses ranged from 1 (never) to 4 (always), with higher scores indicating better involvement in shared decision-making.

Four questions regarding health-related attitudes were used to index the degree of perceived value of health care. These four questions were previously validated to measure skepticism toward medical care:[21,33] (1) do not need health insurance, (2) health insurance is not worth the money it costs, (3) more likely to take risks than the average person, and (4) can overcome illness without help from a medically trained person. Responses were based on a five-point Likert scale and ranged from 1 (disagree strongly) to 5 (agree strongly). They were reverse scored, that is, higher scores represented better perceived value of health care.

Access to care outcomes

Primary outcome measures were perceived access to care (concept A) and realized care (i.e., actual use of services; concept B), for which we used 'unmet needs of health service' as a proxy. The measurement of perceived access to care consisted of three items rated using a four-point Likert scale ranging from 1 (never) to 4 (always); items included (1) how often got an appointment for health care as soon as needed, (2) how often got care right away, and (3) how often it was easy to get care, tests, or treatment that was necessary in the last 12 months (concept A). Unmet need of health services was measured with four dichotomous items (0 [no] versus 1 [yes]), asking whether an individual was unable to receive or was delayed in receiving necessary medical and prescription medicine treatments (concept B). Responses were scaled with a higher score indicating better perceived access to care or greater unmet need of health care.

Table 1 – Descriptive statistics of sample characteristics.

Characteristics	Mean ± SD or %
Sample N	15,787
Mean age in years	52.3 ± 17.6
Sex	
Female	61.2%
Male	38.8%
Race/ethnicity	
Hispanic	17.6%
Non-Hispanic white	53.4%
Non-Hispanic black	19.2%
Other/multiracial	9.8%
Education	
HS/GED or less	39.8%
Some college	31.0%
College and postcollege graduate	29.1%
Family income	
Low income (>FPL 200%)	34.9%
Middle income (FPL 200–399%)	28.2%
High income (FPL 400% or higher)	36.9%
Marital status	
Married	52.9%
Employment	
Employed	53.1%
Region	
Northeast	16.5%
Midwest	21.1%
South	35.8%
West	26.6%
Self-reported health status	
Excellence/very good/good	77.2%
Fair/poor	32.5%
Number of comorbidities	
0	32.4%
1	25.0%
2	20.6%
3+	22.0%
Insurance type	
Private	67.5%
Public	32.5%
Having a USC	
Yes	89.8%
No	10.2%
Travel time to provider	
Less than 15 min	49.5%
15–30 min	39.7%
More than 30 min	10.8%
Number of visits to care[a]	10.9 ± 16.7
Had problems paying medical bills [a]	
Yes	14.6%
No	85.4%

SD, standard deviation; HS, high school; GED, general educational development; FPL, federal poverty level; USC, usual source of care; MEPS, Medical Expenditure Panel Survey.

Percentages are weighted based on complex MEPS design.

[a] In the past 12 months.

Other covariates

Based on Andersen's access to care framework,[18,19] we selected and included individual covariates that are potentially related to utilization of health care. Predisposing factors included age, sex, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, non-Hispanic Asian, and other race/ethnicity groups), education (number of years for education), family income level (0–99% federal poverty level [FPL], 100%–199% FPL, 200%–399% FPL, and 400% FPL), employment, and marital status. Health need factors included self-reported health status (as the perceived need for health services) and a number of comorbid conditions (as evaluated need, including hypertension, high cholesterol, coronary heart disease, angina, myocardial infarction, other heart diseases, stroke, emphysema, diabetes, arthritis, and asthma).

Statistical analyses

Initially, we conducted a missing value analysis and imputed missing data using previously validated approaches.[34] Missing values varied from 0.1% (employment status) to 16.9% (asking patient to help make decisions between choices of treatment). First, missing values for sociodemographic information were treated by pairwise deletion. For health conditions, missing values were replaced with a value of '0' as a conservative approach to count the number of comorbidities. Multiple imputations using the expectation–maximum algorithm was performed to fill in the remaining missing data. Then, descriptive statistics were performed with SPSS Complex Samples (version 24; IBM Corp., Armonk, NY) to summarize sample characteristics, and zero-order Pearson correlations between measured and latent variables were examined to check the discriminant validity (Appendix Table). We conducted structural equation modeling (SEM) with maximum likelihood estimation for model testing using SPSS AMOS (version 22; IBM SPSS, Chicago, IL). SEM was performed to test hypothesized pathways in our conceptual model adjusting for covariates including age, sex, race/ethnicity, education, family income, employment and marital status. To estimate standard errors of direct and indirect effects among pathways, we used a bootstrapping procedure with 1000 resamples.[35] Model fit was evaluated using five indexes: the goodness of fit index, comparative fit index (CFI), normed fit index (NFI), incremental fit index (IFI), standardized root mean squared residual (SRMR), and root mean square error of approximation (RMSEA). We used conventional cutoff criteria indicating an acceptable model fit that values are greater than 0.90 for CFI, NFI, and IFI and values are less than 0.065 for SRMR and RMSEA.[36,37] Hypothesis tests were two tailed with a critical α of 0.05.

Results

Structural equation modeling analyses

Our final model indicated that all items had significant loadings on the factors they were assumed to load, supporting the adequacy of items used to represent respective latent factors (convergent validity). For discriminant validity, correlations between factors of patient-centered care quality, access-enabling, and access to care outcomes ranged from 0.02 to 0.58 with no item for all the variables with correlations greater than 0.60 (Appendix Table). Fig. 2 displays the pathways and magnitude of the associations tested in the models for perceived access to care (A) and unmet needs of health care (B); the results are presented as standardized β coefficients. Table 3 presents the direct and indirect effects of the

Table 2 – Descriptive statistics of patient-centered care quality factors and access to care outcomes with rotated factor loadings.

Variables	Mean (SD)	Range	Rotated factor loadings[a]				
			Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Interaction quality with providers[b]							
Explained things easy to understand	3.59 (0.61)	1–4	0.792				
Showed respect for what patient said	3.64 (0.60)	1–4	0.788				
Listened to patient carefully	3.58 (0.63)	1–4	0.778				
Spent enough time with patient	3.45 (0.70)	1–4	0.747				
Given instruction/advice easy to understand	3.61 (0.56)	1–4	0.653				
Overall rating of received care	8.36 (1.72)	0–10	0.540				
Composite score	26.24 (3.87)	5–30	Cronbach's alpha: Factor 1 = 0.795				
Shared decision-making[c]							
Asked about and showed respect for medical treatment that patient was happy with	3.59 (0.64)	1–4		0.629			
Asked patient to help make decisions	3.38 (0.83)	1–4		0.628			
Composite score	6.98 (1.24)	2–8	Cronbach's alpha: Factor 2 = 0.613				
Value of health care (reverse scored)[d]							
Do not need help from health providers	1.86 (1.14)	1–5			0.625		
Do not need health insurance	1.41 (0.87)	1–5			0.579		
Not worth having health insurance	2.07 (1.30)	1–5			0.583		
Willing to take risks	2.03 (1.19)	1–5			0.536		
Composite score	6.63 (3.14)	4–20	Cronbach's alpha: Factor 3 = 0.704				
Access to care[e]							
Got care when needed	3.55 (0.57)	1–4				0.613	
Made appointments when wanted	3.42 (0.73)	1–4				0.608	
Easy to get necessary medical care	3.57 (0.67)	1–4				0.520	
Composite score	10.55 (1.68)	3–12	Cronbach's alpha: Factor 4 = 0.755				
Unmet needs of health care[f]							
Unable to receive necessary medical care	1.96 (0.17)	1–2					0.574
Delayed in receiving necessary medical care	1.94 (0.23)	1–2					0.555
Delayed in receiving necessary prescription medicine	1.94 (0.22)	1–2					0.537
Unable to receive necessary prescription medicine	1.96 (0.17)	1–2					0.521
Composite score	4.17 (0.55)	4–8	Cronbach's alpha: Factor 5 = 0.658				

SD, standard deviation.

[a] Exploratory factor analysis was conducted using Varimax and Promax rotation with Kaiser normalization (N = 15,787). Kaiser-Meyer-Olkin measure indicated a sampling adequacy of .880, $P < .001$. Eigenvalues >1 were extracted. Factor loadings < .4 are suppressed.

[b] Responses were scored using a Likert scale ranging from 1 (never) to 4 (always), with higher scores indicating better quality of interaction with health provider.

[c] Responses ranged from 1 (never) to 4 (always), with higher scores indicating better involvement in shared decision-making.

[d] Responses were based on a five-point Likert scale and ranged from 1 (disagree strongly) to 5 (agree strongly). They were reverse scored, that is, higher scores represented better perceived value of health care.

[e] Responses ranged from 1 (never) to 4 (always), with higher scores indicating better perceived access to care.

[f] Measured with four dichotomous items (0 [no] versus 1 [yes]), with a higher score indicating greater unmet need of care.

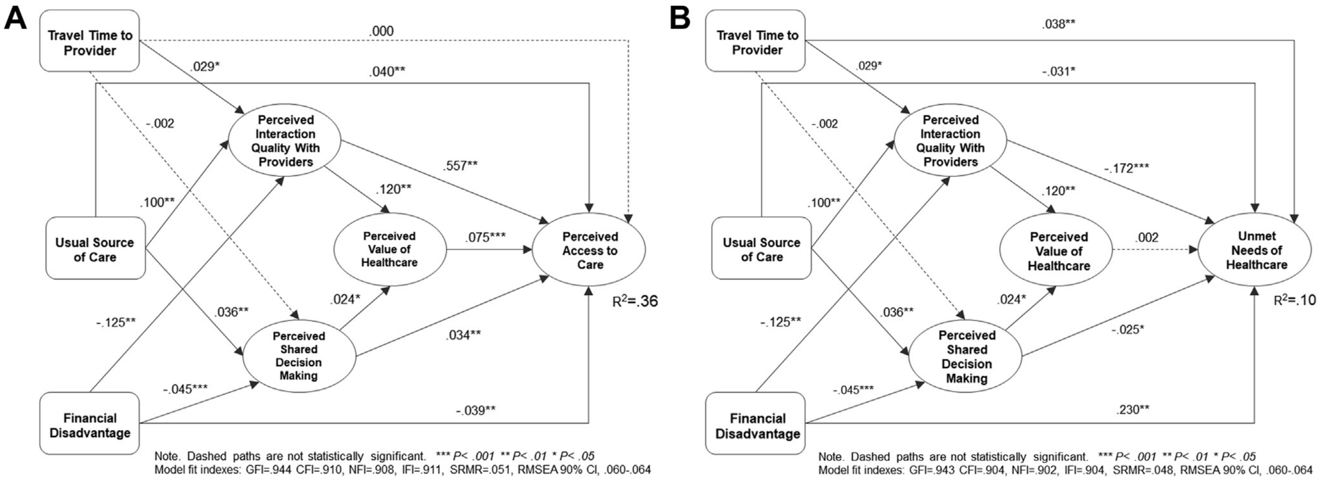
measured and latent factors on access to care outcomes. The models were adjusted for covariates including sociodemographic characteristics and health conditions, but their associations are not shown for parsimony.

Perceived access to care model (concept A)

As shown in Fig. 2 (A), having a USC directly and positively affected perceived interaction quality with providers, shared decision-making, and perceived access to care ($\beta = 0.036$ to 0.100, $P = .003$). However, financial disadvantage had direct and negative effects on them ($\beta = -0.125$ to -0.045, $P = .002$ to < .001). The results of bootstrapping showed that the indirect effects of perceived interaction quality with providers ($P < .001$) and perceived shared decision-making ($P = .04$) on perceived access to care were detected through perceived value of health care (Table 3). We found the significant indirect effects of travel time to provider and financial disadvantage ($\beta = -0.073$ to 0.016, $P = .02$ to .03) on perceived access to care, through patient-centered care factors, suggesting partial mediating effects. The effect of USC on perceived access to care was significantly enhanced by patient-centered care quality factors (direct effect, 0.040 + indirect effect, 0.058 = total effect, 0.098, $P = 0.003$; Table 3).

Unmet needs of healthcare model (concept B)

The associations between enabling and patient-centered care quality factors were identical to those of the model for perceived access to care (Fig. 2-B). Both travel time to the provider and financial disadvantage had direct and positive effects on unmet needs of health care, indicating the association with increased unmet needs of health care. The results of bootstrapping showed significant indirect effects of USC



Note. Dashed paths are not statistically significant. *** P< .001 ** P< .01 * P< .05
Model fit indexes: GFI=.944 CFI=.910, NFI=.908, IFI=.911, SRMR=.051, RMSEA 90% CI, .060-.064

Note. Dashed paths are not statistically significant. *** P< .001 ** P< .01 * P< .05
Model fit indexes: GFI=.943 CFI=.904, NFI=.902, IFI=.904, SRMR=.048, RMSEA 90% CI, .060-.064

Fig. 2 – Path analysis results. Path models of access-enabling factors and patient-centered quality factors on (A) perceived access to care and (B) unmet needs of health care. The R^2 values provide explained variance among construct variables (36% of the variance in perceived access to care and 11% of the variance in the unmet needs of health care). Relationships are measured using standardized coefficients (β). Dashed paths are not statistically significant. $^{***}P < .001$; $^{**}P < .01$; $^{*}P < .05$. Model fit indexes for (A): GFI = .944, CFI = .910, NFI = .908, IFI = .911, SRMR = .051, RMSEA 90% CI, .060–.064. Model fit indexes for (B): GFI = .943, CFI = .904, NFI = .902, IFI = .904, SRMR = .048, RMSEA 90% CI, .060–.064

(P = .002), travel time to provider (P = .04), and financial disadvantage (P < .001) on unmet needs of health care, through patient-centered care quality factors as observed in the model for perceived access to care (Table 3).

Discussion

Despite the historically low uninsured rates under the ACA, the US population has witnessed a persistent issue in access to quality of care. Growing evidence has suggested that having health insurance may not guarantee equal access to appropriate/necessary health care.[1,13–15,38] In the present study, we found that having a USC, perceived interaction quality with providers, and shared decision-making were associated with higher perceived access to care or reduced unmet needs of health care. These findings are consistent with previous studies, suggesting that improved quality of health services was associated with higher satisfaction with received care and increased perceived value of health care.[22,39] These associations, in turn, would be expected to improve continuity of care or receipt of needed health services.[21,40–42]

Table 3 – Final path model parameter estimates of geographic access, financial disadvantage, and patient-centered care quality factors on access to care outcomes.

Parameter	Standardized estimates (95% CI)		
	Direct effects	Indirect effects	Total effects
Outcome: perceived access to care			
Usual source of care	.040*** (.019 to .064)	.058** (.042 to .074)	.098** (.072 to .127)
Travel time	–	.016* (.001 to .031)	.016 (−.012 to .040)
Financial difficulty	−.039** (−.060 to −.019)	−.073*** (−.087 to −.059)	−.112** (−.136 to −.088)
Interaction quality	.557*** (.538 to .579)	.009** (.006 to .012)	.566*** (.547 to .587)
Shared decision-making	.034** (.013 to .054)	.002* (.000 to .004)	.035** (.015 to .057)
Value of health care	.075** (.055 to .094)	–	.075** (.055 to .094)
Outcome: unmet needs of health care			
Usual source of care	−.031* (−.062 to −.005)	−.018*** (−.025 to −.013)	−.049** (−.079 to −.021)
Travel time	.038** (.010 to .068)	−.005* (−.010 to .000)	.033* (.005 to .062)
Financial difficulty	.230** (.200 to .259)	.023*** (.017 to .029)	.252** (.222 to .282)
Interaction quality	−.172** (−.203 to −.144)	–	−.172*** (−.203 to −.144)
Shared decision-making	−.025 (−.052 to .000)	–	−.025 (−.052 to .000)
Value of health care	.002 (−.020 to .021)	–	.002 (−.020 to .021)

CI, confidence interval.
Results are estimated based on 1000 bootstrap samples.
$^{*}P < .05$ $^{**}P < .01$ $^{***}P < .001$.

We also found that longer travel time to a provider and having financial disadvantage of paying medical bills negatively affected access to care outcomes; however, these associations were mediated by patient-centered care quality factors. Although travel time and associated costs are well-known factors hindering patient access to provider,[27] our findings indicated that travel time was not associated with perceived access to care but with unmet needs of health care. This suggests that individuals may not consider geographic factors when they evaluate their potential access to care, but they may experience difficulties in the actual use of health care (i.e., realized access). In both path models, we also observed that higher perceived interaction quality with providers and shared decision-making were positively associated with the perceived value of health care, which is consistent with previous studies.[22] However, the perceived value of health care was only associated with perceived access to care, not unmet needs of health care, suggesting that perceived value of health care may not contribute to the individual propensity of health services use.

There are several possible explanations for the effects of patient-centered care quality on access to care. First, patients with better-than-expected satisfaction from received care tend to become loyal to their providers and more adherent to recommended medical treatment, screening, and medication,[41,43] triggering revisits to the same providers. Second, active interaction with providers may increase patients' chance of getting involved in decision-making process and making informed decisions with providers about necessary care;[25,26] patients who are well-informed may have less unmet needs for health care. Third, established relationship or rapport with providers through patient-centered care services could help maintain continuity of care.[40,42] For the mediation effect, it is possible that higher satisfaction or established rapport with providers attenuates effects of barriers to access health services that patient may have (travel time and financial disadvantage in this study). Previous studies found that patients who were more highly satisfied with care switched providers less frequently independently of distance.[44] Furthermore, although those with low income—also more likely to have financial disadvantage—were found to be passive when seeking alternatives to their existing providers,[28] literature has suggested that perceived financial burden is not associated with discouraged use of health services[45] and financial burden of patients could be mediated by improved care or service quality.[22,46]

Patient's experience of care is often translated and interpreted for overall quality of health services.[20,22,39] Like other industries, the aspect of service quality has been emphasized and become a vital component of both performance and profitability in health services organizations.[47,48] Despite a lack of evidence that improved patient experience directly translates to better clinical outcomes,[49] patient satisfaction is the most accepted measure of quality of health services. Moreover, much evidence has demonstrated that improving quality of health services could help improve overall care quality and reduce healthcare costs.[50,51] Our findings add further evidence that quality of health services is valued as a fundamental component of movement toward value-based care[47] and suggest that providing patient-centered care may improve access to health services among medical consumers by mediating geographical and financial barriers that they may have or enhancing already established relationship with providers.

There are several important limitations. The main weakness of this study is the retrospective cross-sectional nature of the analysis, which could result in inaccuracies of self-reported information and the inability to draw causal inferences from the observed relationships. Future studies should utilize longitudinal data in order to confirm the findings of this study, especially the mediation effects of patient-centered care quality factors on access to care, as well as other patient outcomes. Second, some estimated path associations were relatively small and may not be precise; however, this was mainly due to controlling for covariates, and small magnitudes of association are the nature of SEM.[52] Lastly, as we demonstrated in this study, access to care or process that individual seeks health services is a complex phenomenon and has multiple dimensions of access outcomes (e.g., equitable access, effective access, efficient access).[19] Future studies on access to care should attempt to identify or develop measures that can capture the complex and multidimensional access to care outcomes, rather than simply examining use of services or availability of provider.[27]

Conclusions

The present study demonstrates that better patient-centered care by providers is strongly associated with access to health care and could mediate the negative effects of geographic and financial barriers. While the primary goal of the current health reform is to improve access to quality care, our findings suggest that policy efforts focusing on improving patient experience may be an effective approach along with coverage expansion to enhance access to quality care and to respond to patient's needs.

Author statements

Ethical approval

No ethical approval is needed for this study because it uses data that are completely deidentified and available to the public.

Funding

The author received no financial support for the research.

Competing interests

The author has no conflict of interest to declare.

REFERENCES

1. Hong YR, Holcomb D, Bhandari M, Larkin L. Affordable care Act: comparison of healthcare indicators among different insurance

beneficiaries with new coverage eligibility. *BMC Health Serv Res* 2016;**16**(1):114. https://doi.org/10.1186/s12913-016-1362-1.

2. Meyer PA, Yoon PW, Kaufmann RB. Introduction: CDC health disparities and inequalities report - United States, 2013. *MMWR Morb Mortal Wkly Rep* 2013;**62**(Suppl. 3):3–5. http://www.ncbi.nlm.nih.gov/pubmed/24264513.
3. Faden L, Vialle-Valentin C, Ross-Degnan D, Wagner A. *The role of health insurance in the cost-effective use of medicines*. 2011. http://www.haiweb.org/medicineprices/05062011/Health insurance final May2011.pdf.
4. OECD.. *Universal health coverage and health outcomes*. Paris, France. 2016. https://www.oecd.org/els/health-systems/Universal-Health-Coverage-and-Health-Outcomes-OECD-G7-Health-Ministerial-2016.pdf.
5. Cohen RA, Martinez ME, Zammitti E. *National health interview survey early release program health insurance coverage: early release of estimates from the national health interview survey, 2016*. 2017. https://www.cdc.gov/nchs/data/nhis/earlyrelease/insur201609.pdf.
6. Keith K. *Two new federal surveys show stable uninsured rate*. 2018. https://doi.org/10.1377/hblog20180913.896261.
7. Sommers BD, Gunja MZ, Finegold K, Musco T. Changes in self-reported insurance coverage, access to care, and health under the affordable care Act. *J Am Med Assoc* 2015;**314**(4):366–74. https://doi.org/10.1001/jama.2015.8421.
8. Wherry LR, Miller S. Early coverage, access, utilization, and health effects associated with the affordable care Act Medicaid expansions: a quasi-experimental study. *Ann Intern Med* 2016;**164**(12):795–803. https://doi.org/10.7326/M15-2234.
9. Obama B. United States health care reform. *J Am Med Assoc* 2016;**316**(5):525–32. https://doi.org/10.1001/jama.2016.9797.
10. Golberstein E, Gonzales G, Sommers BD. California's early ACA expansion increased coverage and reduced out-of-pocket spending for the state's low-income population. *Health Aff* 2015;**34**(10):1688–94. https://doi.org/10.1377/hlthaff.2015.0290.
11. Chen J, Vargas-Bustamante A, Mortensen K, Ortega AN. Racial and ethnic disparities in health care access and utilization under the affordable care Act. *Med Care* 2016;**54**(2):140–6. https://doi.org/10.1097/MLR.0000000000000467.
12. Alcalá HE, Chen J, Langellier BA, Roby DH, Ortega AN. Impact of the affordable care Act on health care access and utilization among latinos. *J Am Board Fam Med* 2017;**30**(1):52–62. https://doi.org/10.3122/jabfm.2017.01.160208.
13. Hong YR, Jo A, Mainous AG. Up-to-Date on preventive care services under affordable care Act: a trend analysis from MEPS 2007-2014. *Med Care* 2017;**55**(8):771–80. https://doi.org/10.1097/MLR.0000000000000763.
14. Rhodes KV, Basseyn S, Friedman AB, Kenney GM, Wissoker D, Polsky D. Access to primary care appointments following 2014 insurance expansions. *Ann Fam Med* 2017;**15**(2):107–12. https://doi.org/10.1370/afm.2043.
15. Torres H, Poorman E, Tadepalli U, et al. Coverage and access for Americans with chronic disease under the affordable care Act. *Ann Intern Med* 2017;**166**(7):472. https://doi.org/10.7326/M16-1256.
16. US Department of Health and Human Services. *Better, Smarter, Healthier: in historic announcement, HHS sets clear goals and timeline for shifting Medicare reimbursements from volume to value*. 2015. https://www.hhs.gov/about/news/2015/01/26/better-smarter-healthier-in-historic-announcement-hhs-sets-clear-goals-and-timeline-for-shifting-medicare-reimbursements-from-volume-to-value.html. [Accessed 20 July 2017].
17. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav* 1995;**36**(1):1–10. https://doi.org/10.2307/2137284.
18. Babitsch B, Gohl D, von Lengerke T. Re-revisiting Andersen's behavioral model of health services use: a systematic review of studies from 1998-2011. *Psycho Soc Med* 2012;**9**. https://doi.org/10.3205/psm000089. Doc11.
19. Andersen RM, Davidson PL, Baumeister SE. Improving access to care. In: *Changing the US health care system: key issues in health services policy and management*. San Francisco, CA: Jossey-Bass; 2013. p. 33–69.
20. Anhang Price R, Elliott MN, Zaslavsky AM, et al. Examining the role of patient experience surveys in measuring health care quality. *Med Care Res Rev* 2014;**71**(5):522–54. https://doi.org/10.1177/1077558714541480.
21. Hong YR, Tauscher J, Cardel M. Distrust in health care and cultural factors are associated with uptake of colorectal cancer screening in Hispanic and Asian Americans. *Cancer* 2018;**124**(2):335–45. https://doi.org/10.1002/cncr.31052.
22. Hong YR, Holcomb D, Ballard M, Schwartz L. Multigroup path analysis of the influence of healthcare quality, by different health insurance types. *J Healthc Manag* 2017;**62**(2):93–105. https://doi.org/10.1097/JHM-D-17-00008.
23. Renedo A, Marston C. Developing patient-centred care: an ethnographic study of patient perceptions and influence on quality improvement. *BMC Health Serv Res* 2015;**15**(1):122. https://doi.org/10.1186/s12913-015-0770-y.
24. Saha S, Arbelaez JJ, Cooper LA. Patient-physician relationships and racial disparities in the quality of health care. *Am J Public Health* 2003;**93**(10):1713–9. https://doi.org/10.2105/AJPH.93.10.1713.
25. Joosten EAG, DeFuentes-Merillas L, de Weert GH, Sensky T, van der Staak CPF, de Jong CAJ. Systematic review of the effects of shared decision-making on patient satisfaction, treatment adherence and health status. *Psychother Psychosom* 2008;**77**(4):219–26. https://doi.org/10.1159/000126073.
26. Stacey D, Bennett CL, Barry MJ, et al. Decision aids for people facing health treatment or screening decisions. In: Stacey D, editor. *Cochrane database of systematic reviews*. Chichester, UK, UK: John Wiley & Sons, Ltd; 2011. https://doi.org/10.1002/14651858.CD001431.pub3.
27. Levesque J-F, Harris MF, Russell G. Patient-centred access to health care: conceptualising access at the interface of health systems and populations. *Int J Equity Health* 2013;**12**(1):18. https://doi.org/10.1186/1475-9276-12-18.
28. Victoor A, Delnoij DM, Friele RD, Rademakers JJ. Determinants of patient choice of healthcare providers: a scoping review. *BMC Health Serv Res* 2012;**12**(1):272. https://doi.org/10.1186/1472-6963-12-272.
29. Osborn R, Moulds D, Squires D, Doty MM, Anderson C. International survey of older adults finds shortcomings in access, coordination, and patient-centered care. *Health Aff* 2014;**33**(12):2247–55. https://doi.org/10.1377/hlthaff.2014.0947.
30. Agency for Healthcare Research and Quality. *MEPS HC-036: 1996-2015 pooled linkage variance estimation file*. 2017. https://meps.ahrq.gov/data_stats/download_data/pufs/h36/h36u15doc.shtml.
31. Agency for Healthcare Research and Quality. *MEPS HC-181 2015 full year consolidated data file*. 2017. https://meps.ahrq.gov/mepsweb/data_stats/download_data_files_detail.jsp?cboPufNumber=HC-181. [Accessed 30 November 2017].
32. Conway JM, Huffcutt AI. A review and evaluation of exploratory factor Analysis practices in organizational research. *Organ Res Methods* 2003;**6**(2):147–68. https://doi.org/10.1177/1094428103251541.
33. Jerant A, Fiscella K, Franks P. Health characteristics associated with gaining and losing private and public health insurance. *Med Care* 2012;**50**(2):145–51. https://doi.org/10.1097/MLR.0b013e31822dcc72.

34. Allison PD. Missing data techniques for structural equation modeling. *J Abnorm Psychol* 2003;**112**(4):545–57. https://doi.org/10.1037/0021-843X.112.4.545.
35. Cheung GW, Lau RS. Testing mediation and suppression effects of latent variables. *Organ Res Methods* 2008;**11**(2):296–325. https://doi.org/10.1177/1094428107300343.
36. Woo J. *Concept and comprehensive for structural equation modeling*. 1st ed. Seoul, South Korea: Hanarae Press; 2012.
37. Awang Z. *Structural equation modeling using AMOS graphic*. Penerbit Universiti Teknologi MARA; 2012.
38. Shi L, Nie X, Wang T-F. Type of usual source of care and access to care. *J Ambul Care Manag* 2013;**36**(3):209–21. https://doi.org/10.1097/JAC.0b013e318295fb79.
39. Dagger TS, Sweeney JC, Johnson LW. A hierarchical model of health service quality. *J Serv Res* 2007;**10**(2):123–42. https://doi.org/10.1177/1094670507309594.
40. Dang BN, Westbrook RA, Black WC, Rodriguez-Barradas MC, Giordano TP. Examining the link between patient satisfaction and adherence to HIV care: a structural equation model. *PLoS One* 2013;**8**(1). https://doi.org/10.1371/journal.pone.0054729.
41. Haskard Zolnierek KB, DiMatteo MR. Physician communication and patient Adherence to treatment. *Med Care* 2009;**47**(8):826–34. https://doi.org/10.1097/MLR.0b013e31819a5acc.
42. Street RL, Makoul G, Arora NK, Epstein RM. How does communication heal? Pathways linking clinician-patient communication to health outcomes. *Patient Educ Counsel* 2009;**74**(3):295–301. https://doi.org/10.1016/j.pec.2008.11.015.
43. Astuti HJ, Nagase K. Patient loyalty to health care organizations: strengthening and weakening (satisfaction and provider switching). *J Med Mark Dev Diagn Pharm Mark* 2014;**14**(4):191–200. https://doi.org/10.1177/1745790415578311.
44. Robertson R, Burge P. The impact of patient choice of provider on equity: analysis of a patient survey. *J Health Serv Res Policy* 2011;**16**(Suppl. 1):22–8. https://doi.org/10.1258/jhsrp.2010.010084.
45. Patel MR, Brown RW, Clark NM. Perceived parent financial burden and asthma outcomes in low-income, urban children. *J Urban Health* 2013;**90**(2):329–42. https://doi.org/10.1007/s11524-012-9774-7.
46. Chino F, Peppercorn J, Taylor Jr DH, et al. Self-reported financial burden and satisfaction with care among patients with cancer. *Oncol* 2014;**19**(4):414–20. https://doi.org/10.1634/theoncologist.2013-0374.
47. Manchikanti L, Helm Ii S, Calodney AK, Hirsch JA. Merit-based incentive payment system: meaningful changes in the final rule brings cautious optimism. *Pain Physician* 2017;**20**(1):E1–12. http://www.ncbi.nlm.nih.gov/pubmed/28072793.
48. Richter JP, Muhlestein DB. Patient experience and hospital profitability. *Health Care Manag Rev* 2017;**42**(3):247–57. https://doi.org/10.1097/HMR.0000000000000105.
49. Fenton JJ. The cost of satisfaction. *Arch Intern Med* 2012;**172**(5):405. https://doi.org/10.1001/archinternmed.2011.1662.
50. Tsai TC, Orav EJ, Jha AK. Patient satisfaction and quality of surgical care in US hospitals. *Ann Surg* 2015;**261**(1):2–8. https://doi.org/10.1097/SLA.0000000000000765.
51. O'Donnell R, Anand NS, Ganser C, Wexler N. The Accountable Care Organization results: population health management and quality improvement programs associated with increased quality of care and decreased utilization and cost of care. *Fam Med Community Heal* 2015;**3**(1):30–8. https://doi.org/10.15212/FMCH.2015.0111.
52. Tomarken AJ, Waller NG. Structural equation modeling: strengths, limitations, and misconceptions. *Annu Rev Clin Psychol* 2005;**1**(1):31–65. https://doi.org/10.1146/annurev.clinpsy.1.102803.144239.

Appendix

Table – Bivariate correlations among patient-centered care quality factors, enabling factors, and access to care outcomes.

Variables	1	2	3	4	5	6	7	8
1. Usual source of care	–							
2. Travel time to provider	−.001	–						
3. Financial disadvantage	−.035**	.023*	–					
4. Interaction quality with provider	.109**	.001	−.130**	–				
5. Shared decision-making	.037**	−.006	−.047**	.340**	–			
6. Value of health care	.153**	.025*	−.010	.136**	.065**	–		
7. Access to care	.113**	−.005	−.114**	.584**	.230**	.153**	–	
8. Unmet needs of health care	−.029**	.055**	.256**	−.209**	−.093**	−.005	−.231**	–

*P < 0.05, **P < 0.01.