

Should Physicians Be More Collaborative?  
Determining the Relationship Between Patient Participation and  
Treatment Plan Confidence Across a Spectrum of Illness  
Severity in the State of California

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**ABSTRACT**

Recent waves of social change have led to drastic shifts of the patient role within modern patient-physician relationships, as current literature documents this complex dynamic becoming increasingly collaborative over time. This report aims to determine how such expansions of the patient role influence medical treatment efficacy. Using patient confidence as a proxy for treatment success, the results of this study find patient participation to have a positive, causal relationship with patient confidence in treatment, and thus treatment success, across all illness severity levels. In doing so, the findings of this research justify and encourage physicians to adopt a more collaborative approach when consulting with their patients.

**Keywords:** *Patient Participation, Shared Decision-Making*

### Introduction

Physicians are constantly facing a battle against scarcity when providing healthcare to their patients. Often finding themselves in situations that lack both time and resources, they are forced to make life changing medical decisions for the well-being of those seeking their help under immense pressure. Accordingly, the importance of optimizing these decisions is unquestionable.

One of the major influences of physician decision making is *patient participation*, a term that refers to the amount that a patient contributes to deciding how they will be medically treated. The culture in medicine has more recently started transitioning from encouraging a “paternalistic relationship between physician and patient” to granting the patient more autonomy over their own health (Kaba, 2007, p. 59). An ethical revolution that was first sparked by hospital policy changes in the 1960s, the fight for a patient’s “right to safety, right to be informed, right to choose, and right to be heard” has led hospitals across the United States to increasingly acknowledge patient participation as a vital component to decision making processes (Lee, 2007, p. 11). In the present day, medical practices strongly reflect this shift.

With many economists and public health experts coining it the *shared decision making (SDM) model*, this newly accepted medical approach has completely transformed the dynamic of patient physician interactions. However, while current literature comprehensively documents this transformation, very few studies have analyzed the impacts that this recent shift has had on healthcare quality. As a result, this research report will be conducted to examine how shared decision making between patients and physicians influences healthcare efficacy.

However, before conducting such an investigation, it is important to first review the literature surrounding the patient physician relationship and identify the gaps that remain in our

understanding of this complex social dynamic. Doing so will not only provide context for this research study, but will also illuminate its contribution to the broader discussion of patient care in medicine and allow for a clear research question to be established.

### History of Research and Related Literature

Questions surrounding the physician patient relationship first began in the 1960s and '70s, as part of a larger ethical movement championing self-autonomy. This wave of social revolution caused researchers around the world to begin exploring the desires of patients in medical care delivery, with an example being Free University sociology professor Dr. Adrian Visser's 1984 research paper titled "Patient Education in Dutch Hospitals".

Conducted on a randomly sampled population of patients from over forty hospitals in the Netherlands, Dr. Visser ran multiple regressions investigating the desire for greater patient education. Similar to the methodology of the study proposed in my own research paper, Visser's variable values were based on survey data questioning how much medical information each patient requested. The article concluded that patients at all levels of socioeconomic status under the age of 60 sought a greater amount of medical information from their physicians to a certain degree (Visser, 1984). Visser's study was one of many during the 1980s that provided quantitative evidence solidifying a need to reform the dated physician patient relationship.

Following this development, health economists and experts in the field of medicine began devising a model that would most effectively provide patients with satisfactory levels of involvement in their treatments. The pervasive model became known as "shared-decision making (SDM)," and is now enforced by major medical authorities such as the UK General Medical Council and the Bristol Royal Infirmary.

However, questioning whether physicians themselves felt that this was an effective medical approach, Samantha Pollard conducted a content analysis study of 43 separate studies utilizing physician surveys conducted from 2007 – 2014. She concluded that physicians expressed overwhelmingly positive attitudes for the use of SDM in clinical practice during both primary and secondary care (Pollard, 2015). Thus, the public calls for change of the patient-physician relationship were confirmed to successfully influence the patient role in medicine. In addition, while I do not plan to use content analysis in my paper, Pollard's study is relevant because its findings establish the very concept that my research calls into question and criticizes. However, I am not the first to critique SDM. After becoming firmly cemented in healthcare delivery, the efficacy of this newly developed medical approach became subject to direct scrutiny, as studies began to explore its ability to yield positive results.

One such study was done by Dr. Yves Longtin, which looked to determine the relationship between patient involvement and treatment success. Observing over 500 visits to 45 different physicians in which a prescription was granted, Longtin measured participation by accounting for if a patient suggested a medication to the physician, and success by accounting for those that required a new prescribed medication over a 6-month period. She also attempted to control for education, holding seminars about the illness the patient had before the doctor visits for one group of patients (Longtin, 2010). After running a multivariate regression analysis, her findings concluded that, while the SDM's ability to reduce medical errors was promising, more rigorous testing was needed to account for potential obstacles brought on by cultural and structural issues that might hinder the success of this model.

Further studies on these structural issues in medicine served to prove the point of Longtin's call for more rigorous testing. Dr. Monica Peek studied how race influenced the

physician patient relationship. Running two regression between the ratings of patient satisfaction and race, the study revealed that those of African American and Latino descent had much lower rates of patient satisfaction. Upon qualitative surveys, it was revealed that this was a result of “unconscious provider bias,” with physicians granting different individuals varying levels of autonomy based on race (Peek, 2010). It is also noted that such bias may present itself through other physical traits, such gender and age. According to Peek, this severely breaks down the relationships between patients and physicians, making it increasingly difficult to measure the impacts of SDM. In addition, a more recent study used descriptive statistics to evaluate the efficacy of SDM according to illness severity. The results indicated that patients with acute illnesses benefited from collaborative roles while those with chronic illnesses benefited from a passive role (Tom, 2017). From these studies, it can be seen how any evaluation of shared decision making needs to take race and illness severity into account to provide an accurate assessment of its ability to influence treatment success.

However, a significant study done by Duke University economics professor William Boulding introduced a completely different factor that correlated with success of treatment. Boulding’s research looked to determine the relationship between patient satisfaction/confidence in treatment with its overall effectiveness. The observational study compiled patient ratings of satisfaction to measure their confidence in treatment, while using 30-day readmission rates of these same patients to measure the efficacy of said treatment. The study ran three separate multivariable logistic regression analyses, each one corresponding to a specific medical condition. The study concluded that higher rates of satisfaction/confidence with discharge and treatment planning correlated with lower rates of hospital readmission (Boulding, 2018). The implication of this finding is that greater patient confidence and satisfaction with a treatment plan

leads to a more likely chance of successful health management, which may or may not result from patients having a larger role. Consequently, determining the type of medical approach that instills the most confidence and reassurance in a patient proves imperative to providing the most effective medical care.

### Gaps in Current Research

This review of literature illustrates the complexity within shared decision making that has impeded the assessment of its benefits. As a result, this report will be directly answering Yves Longtin's call for research, attempting to address this complexity by controlling for structural obstacles pointed out by the studies revealing factors such as racism, gender, age, and illness severity. In accordance with Boulding's research, the efficacy of SDM will be determined by measuring its influence on patient confidence, a newly established proxy of treatment success that no other previous study has used. This decision was made because other treatment success proxies, such as patient readmission rates and pharmaceutical drug refills, are inherently much more susceptible to confounding variables, as there is much more temporal distance between time of consultation and time of treatment assessment.

Therefore, the following research study proposes to fill in this gap of knowledge by answering the following question: To what extent does the development of the patient-physician relationship from authoritative to collaborative increase patient confidence in treatment plans across a spectrum of illness severity in the state of California? I hypothesize that participation will have a positive relationship with treatment success for patient populations of diseases with relatively lower severity while having a negative relationship with illnesses of higher severity. This is because I believe that the potentially lethal consequences of an ineffective treatment plan

for for more severe diseases will cause patients to more comfortably grant full authority and medical responsibility to the physician.

### Dataset

In order to answer this question, the following study will be utilizing data from the California Health Interview Survey (CHIS) taken in 2015. A web and telephone questionnaire led by the UCLA Center for Health Policy Research, CHIS provides insight on a wide range of health topics, providing cross-sectional data on over 21,000 randomly sampled Californians from all 58 of the state's counties. It is a renowned dataset that is newly compiled every year, extensive enough in terms of both size and variety to accurately represent the incredibly diverse population of California. Legislators, health policy makers, foundations, and many other notable agencies use CHIS as an aid to improve public health, further validating its credibility and justifying its use within this study.

It is important to also consider that using CHIS limits the scope of this research study to only California. However, this dataset was selected despite this because it is the survey that most appropriately offers figures useful for determining the relationship between patient participation and confidence. It is hoped that the trends found in this study can be roughly applied to US healthcare systems outside of California.

### Methodology

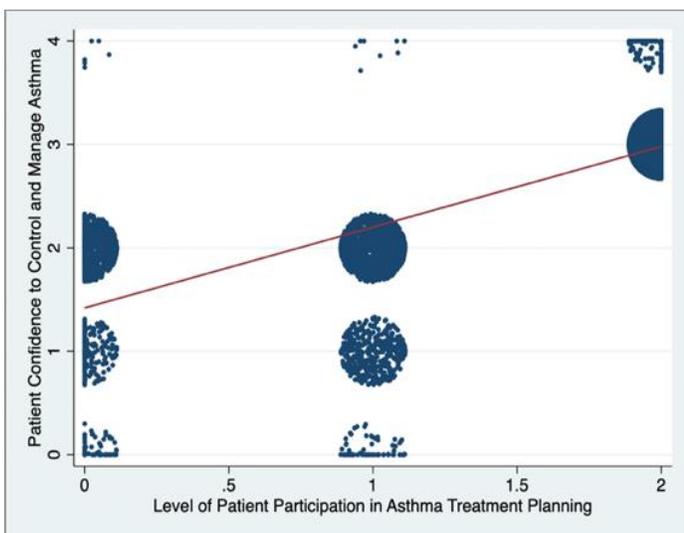
This dataset will be used to run a multivariate OLS regression analysis determining how strongly patient confidence correlates with participation in the treatment planning process. Accordingly, the dependent and independent variables of interest in this study are patient confidence and patient participation. To account for these, two questions within this survey are of importance. The first question asks patients about whether they felt as though their doctor

worked with them while developing a plan for their illness. 0 point indicates that the doctor did not incorporate the patient into the design of the treatment plan, 1 point indicates that they faintly worked with the doctor to develop the eventual treatment plan, and 2 points indicates that they were incorporated in the treatment design process. This data

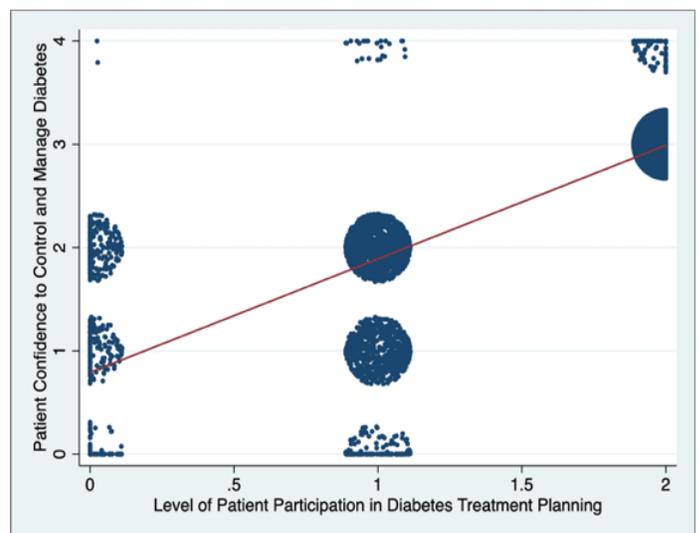
*Table 1: Descriptive Statistics of Patient Participation and Treatment Confidence for Each Illness Patient Population*

Confidence Rating = CD Participation Verdict = PV	Quantiles								
	Variable	n	Mean	S.D.	Min	Max	.25	Median	.75
Asthma PV	3395	1.77	0.56	0.00	2.00	2.00	2.00	2.00	2.00
Asthma CD	3395	2.88	0.52	0.00	4.00	3.00	3.00	3.00	3.00
Diabetes/Pre-Diabetes PV	2560	1.85	0.41	0.00	2.00	2.00	2.00	2.00	2.00
Diabetes/Pre-Diabetes CD	2560	2.83	0.54	0.00	4.00	3.00	3.00	3.00	3.00
Heart Disease PV	1975	1.87	0.39	0.00	2.00	2.00	2.00	2.00	2.00
Heart Disease CD	1975	2.88	0.45	0.00	4.00	3.00	3.00	3.00	3.00

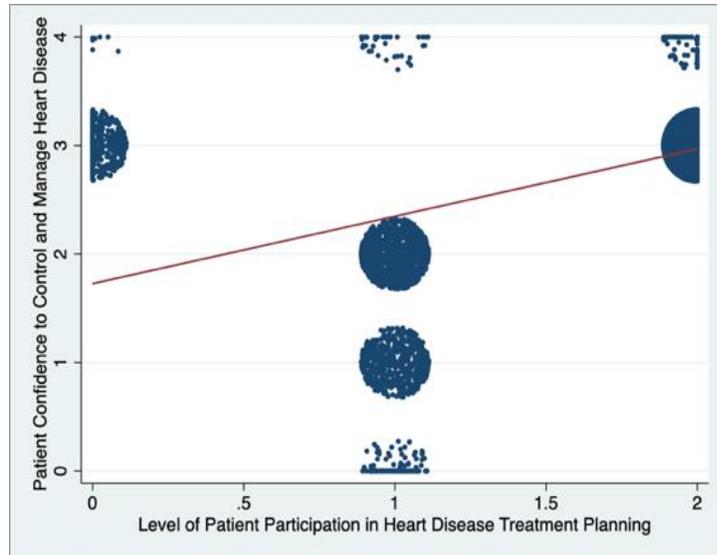
will provide the values for the participation variable. Shortly afterwards, they are asked to rate how confident they are in this plan on a 5-point scale, with utmost confidence being granted the highest point of 4 and the almost no confidence yielding the lowest number of 0. This second question will provide the values that will make up the confidence variable. In this regression, a strong positive correlation tells us that confidence and participation are directly related, meaning greater participation in the planning process yields greater patient confidence in the plan.



*Figure 1: Fitted Line for Regression of Confidence on Participation for Asthma Patients*



*Figure 2: Fitted Line for Regression of Confidence on Participation for Diabetes Patients*



*Figure 3: Fitted Line for Regression of Confidence on Participation for Heart Disease Patients*

However, there are many confounding factors that can influence patient confidence in treatment outside of how much they participated in planning said treatment. Such factors present possible omitted variable bias (OVB) and must be accounted for. Firstly, education can play a large part in how confident or satisfied a patient is with a treatment if they are more knowledgeable on that specific disease, or health in general. As a result, this regression will also include an education variable. These values will be provided by the survey as well, as it asks patients for their education level, ranging from no formal education to getting a doctorate (PhD) on a 9-point scale. Secondly, a mental health metric measures on a 5-point scale called constant hopelessness would also influence how confidently a patient feels about any treatment.

Secondly, past research has shown that racial stereotypes have played a part in the level of autonomy given to patients by physicians. Labeled race-based provider bias (RPB), such discrimination is notorious for breaking down the physician patient relationship, leading to decreased patient satisfaction regardless of how much participation there was. This same concept can be applied to both gender and age, aptly nicknamed GPB and APB respectively. As a result, this regression will include variables that will aim to account for both racial and gender

discrimination. The survey asks patients to rate (on a 6-point scale) the stress they have felt when receiving medical care based on their race. In addition, this survey data also includes a dummy variable to indicate if the patient is male or female (1 or 0 respectively), as well as each patients' age, which will account for both GBP and ABP.

Empirical Strategy

Taking these variables into account, the OLS econometric model discussed above is:

$$CON = \beta_0 + \beta_1PAR + \beta_2EDU + \beta_3RBP + \beta_4SEX + \beta_5AGE + \beta_6HOPE$$

Lastly, illness severity also presents the ability to influence patient confidence. To control for this confounding variable, three regression analyses will be conducted using the model above on three different populations, subdivided from the population survey based on what disease they are reported to have. Each disease will represent varying levels of severity, with asthma representing the lowest level, diabetes representing the middle level, and heart disease representing the highest level.

This study will also be running a 2SLS instrumental variable regression to account for any endogeneity within the patient participation regressor. A rating of “constant self-worthlessness” (surveyed in mental health section on 3-point scale) will be used as an instrumental variable. In addition, a response to the question of whether the patient elected to get

*Table 2: Descriptive Statistics for Confounding and Instrumental Variables*

Variable	n	Mean	S.D.	Min	Max	.25	Median	.75
Asthma								
Education	3395	4.99	2.25	1.00	9.00	3.00	4.00	7.00
RBP	3395	1.71	0.89	1.00	4.00	1.00	1.00	2.00
Sex	3395	0.43	0.48	0.00	1.00	0.00	0.00	1.00
Age	3395	47.48	18.35	18.00	85.00	30.00	50.00	60.0
Hopelessness	3395	3.41	1.24	1.00	5.00	3.00	3.00	4.00
Worthlessness	3395	3.68	1.05	1.00	5.00	2.00	3.00	4.00
Plan	3395	0.26	.13	0.00	1.00	0.00	0.00	1.00
Diabetes/Pre-Diabetes								
Education	2560	4.64	3.12	1.00	9.00	3.00	4.00	7.00
RBP	2560	2.13	1.03	1.00	4.00	1.00	1.00	2.00
Sex	2560	.58	0.51	0.00	1.00	0.00	0.00	1.00
Age	2560	43.21	14.12	18.00	85.00	30.00	50.00	60.0
Hopelessness	2560	3.20	1.49	1.00	5.00	3.00	3.00	4.00
Worthlessness	2560	3.92	1.03	1.00	5.00	2.00	3.00	4.00
Plan	2560	0.33	.28	0.00	1.00	0.00	0.00	1.00
Heart Disease								
Education	1975	4.14	2.76	1.00	9.00	3.00	4.00	6.00
RBP	1975	1.71	0.89	1.00	4.00	1.00	1.00	2.00
Sex	1975	0.51	0.54	0.00	1.00	0.00	0.00	1.00
Age	1975	44.49	15.31	32.00	85.00	42.00	55.00	80.0
Hopelessness	1975	3.97	2.14	1.00	5.00	3.00	3.00	4.00
Worthlessness	1975	4.09	.89	1.00	5.00	2.00	3.00	4.00
Plan	1975	0.64	.32	0.00	1.00	0.00	0.00	1.00

an electronic or paper copy of the treatment plan will be used as an instrumental variable as well. 1 point was given for electronic, 2 for paper, and -1 for if the physician chose the plan for the patient. This value will be converted into a dummy variable in which 1 = electing for a preferred plan recording method and 0 = having the physician decide. Due to the fact that it is the most recent act done by the patient, despite not occurring during the actual treatment planning process, there is a strong chance that patients will see this as an act of participation, and would be thus related to the endogenous regressor, patient participation. Table 3 substantiates these claims, verifying the relevance of these two instruments.

In addition, the assumption of exogeneity for this dummy variable in regard to patient confidence in treatment is appropriate because patients are told they can request copies of treatment from nurses or physician assistants after the actual physician consultation. The question measuring patient confidence is framed such that patients only refer to the treatment development that occurs when meeting with the actual doctor. Due to the fact that it is not a product of direct communication between the patient and physician, but a choice always made after the physician leaves the consultation room, it should have no bearing on the

*Table 3: Regression of Endogenous Regressor on Instruments and Controls*

VARIABLES	(1) Patient Participation (Asthma)	(2) Patient Participation (Diabetes)	(3) Patient Participation (HD)
Asthma Plan	0.932*** (0.00635)		
Asthma Worthlessness	-0.818*** (0.00579)		
Diabetes Plan		0.820*** (0.00413)	
Diabetes Worthlessness		-0.648 (0.00347)	
HD Plan			0.707*** (0.00444)
HD Worthlessness			-0.920*** (.00371)
Constant	0.599*** (0.0278)	-0.500*** (0.0174)	-0.540*** (0.0179)
Observations	3,395	2,560	1,975
R-squared	0.822	0.792	0.749
Controls	Yes	Yes	Yes

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

confidence score the patient gives based on the treatment plan devised during his/her interaction with the physician.

Secondly, the exogeneity of self-worthlessness to patient confidence in treatment can be verified by the peer reviewed research article of public health specialist and MD Kevin Fiscella. Published in the *Medical Care* journal, Fiscella investigated various potential determinants of patient trust/confidence in their physicians and overall treatment they received from them (2004). Controlling for gender, age, race, various mental health metrics, and other factors pertaining to the patient and physician, he concludes that the largest element of influence on patient confidence was physician behavioral patterns, with a more minor influence coming from longevity of the patient-physician relationship. More importantly, this research measured and found little to no economic significance between patient confidence in physicians and the mental wellbeing of a patient. The study specifically included depression and anxiety as markers for mental wellbeing, diseases that both have symptoms of self-worthlessness (Fiscella, 2004) Thus, Fiscella's findings help substantiate the claim that self-worthlessness is exogenous to patient confidence in treatment, the dependent variable within my IV regression. The 2SLS econometric model described above is as follows:

First Stage (Reduced) Equation: Endogenous variable regressed on instruments

$$PAR = \gamma_0 + \gamma_1 WOR + \gamma_2 PLAN + \gamma_3 EDU + \gamma_4 RPB + \gamma_5 SEX + \gamma_6 AGE + \gamma_7 HOPE$$

Second Stage Equation: Patient Confidence regressed on endogenous regressor estimates

$$CON = \beta_0 + \beta_1 \widehat{PAR} + \beta_2 EDU + \beta_3 RPB + \beta_4 SEX + \beta_5 AGE + \beta_6 HOPE$$

### Results of Primary Study

In order to conduct any analysis of these results, three key components of these regression models must be addressed. Firstly, coefficients are measured relative to a reference group. These reference groups consist of disease-specific patients who score their participation

during the treatment planning process a 0, have no formal education, are female, are “0” years of age, and score their hopelessness on a daily basis a 0. The confidence in treatment score (CTS) of this reference is captured by  $\beta_0$ .

Secondly, for each regression analysis, independent variables were added iteratively in order to measure how the significance of each changed as the model was being built. After adding all of the independent variables in each regression, it was determined in most cases that all six independent variables were statistically significant at the one percent level. Independent variables that are not either statistically or economically significant (not statistically significant at 1% level and not economically significant if |coefficient| is smaller than 0.1, or .01 for age) will be noted in the analysis below. Lastly, to address the units of these results, each coefficient is measuring changes in the patient CTS score, which was recorded on a 4-point scale.

*Table 4: OLS and IV Regression Results of Patient Participation on Confidence in Treatment for Asthma Population*

VARIABLES	(1) Patient Confidence (OLS Estimate)	(2) Patient Confidence (OLS Estimate)	(3) Patient Confidence (OLS Estimate)	(4) Patient Confidence (OLS Estimate)	(5) Patient Confidence (OLS Estimate)	(6) Patient Confidence (OLS Estimate)	(7) Patient Confidence (IV Estimate)
Patient Participation	0.892*** (0.00512)	0.892*** (0.00230)	0.887*** (0.00226)	0.886*** (0.00226)	0.887*** (0.00225)	0.887*** (0.00225)	1.171*** (0.00528)
Education		0.329*** (0.000908)	0.351*** (0.000892)	0.345*** (0.000891)	0.375*** (0.000888)	0.376*** (0.000887)	0.443*** (0.00117)
RBP			-0.114*** (0.00258)	-0.124*** (0.00259)	-0.133*** (0.00499)	-0.132*** (0.00499)	-0.124*** (0.00661)
Male				0.301*** (0.00416)	0.350*** (0.00415)	0.344*** (0.00415)	0.192*** (0.00550)
Age					-0.0246*** (0.00232)	-0.0253*** (0.00233)	-0.00352*** (0.00308)
Hopelessness						-0.126*** (0.00116)	-0.194*** (0.00153)
Constant	0.972*** (0.00512)	0.805*** (0.00525)	0.891*** (0.00648)	0.943*** (0.00680)	0.943*** (0.00903)	0.992*** (0.00903)	0.845*** (0.0123)
Observations	3,395	3,395	3,395	3,395	3,395	3,395	3,395
R-squared	0.878	0.878	0.882	0.882	0.884	0.884	0.796

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 4 summarizes the OLS regression results for the asthma patient population.  $\beta_0$  of the OLS model run with all independent variables is equal to .992, meaning this reference group

would have a .992 CTS on average. Patient participation is the regressor that has the largest association with CTS, its coefficient being  $\beta_1 = 0.892$ . This indicates that for every additional point that an asthma patient scores on the participation test, the CTS will increase by .892 on average. One of the two other positive coefficients is the male dummy variable, with a value of .344, indicating the expected increase in CTS on average when the patient is male. Education is the other positive coefficient, with a value of 0.176. This value indicates that the CTS increases by 0.176 for every one unit increase in the education rating on average. Race and hopelessness have negative coefficients, with values of -0.132, and -0.126 respectively. These values indicate that CTS decreases by 0.132 for every unit increase in RBP rating and decreases by 0.126 for every unit increase in the hopelessness rating. In addition, age has a negative coefficient as well, with a value of -.0253, meaning for that every additional year of age, CTS decreases by 0.0253. The independent variable coefficient values of the regressions for both diabetes and heart disease (described below) will follow the same corresponding interpretations.

*Table 5: OLS and IV Regression Results of Patient Participation on Confidence in Treatment for Diabetes Population*

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Patient Confidence (OLS Estimate)	Patient Confidence (OLS Estimate)	Patient Confidence (OLS Estimate)	Patient Confidence (OLS Estimate)	Patient Confidence (OLS Estimate)	Patient Confidence (OLS Estimate)	Patient Confidence (IV Estimate)
Patient Participation	1.078*** (0.00752)	1.078*** (0.00275)	1.077*** (0.00271)	1.077*** (0.00271)	1.078*** (0.00268)	1.078*** (0.00268)	1.217*** (0.00371)
Education		0.000104*** (0.000876)	0.000721*** (0.000865)	0.000741*** (0.000865)	0.000173*** (0.000857)	0.000173*** (0.000856)	0.000599*** (0.000912)
RBP			-0.497*** (0.00248)	-0.492*** (0.00250)	-0.347*** (0.00479)	-0.347*** (0.00479)	-0.246*** (0.00509)
Male				0.322* (0.00402)	0.341*** (0.00399)	0.338*** (0.00399)	0.218*** (0.00424)
Age					-0.0479*** (0.00223)	-0.0483*** (0.00223)	-0.00298*** (0.00237)
Hopelessness						-0.0400*** (0.00111)	-0.0461*** (0.00118)
Constant	0.4013*** (0.00740)	0.4808*** (0.00512)	0.4811*** (0.00625)	0.4827*** (0.00661)	0.4812*** (0.00872)	0.4817*** (0.00873)	0.4241*** (0.00938)
Observations	2,560	2,560	2,560	2,560	2,560	2,560	2,560
R-squared	0.881	0.881	0.884	0.884	0.887	0.887	0.872

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 5 summarizes the OLS regression for diabetes patients.  $\beta_0$  of the OLS model run with all independent variables is equal to 0.4817, meaning this reference group would have a 0.4817 CTS on average. Similar to asthma patients, patient participation is the largest regressor for patient confidence in diabetes treatment, with a value of 1.078. Also, the male dummy variable was the only other positive regressor once again, with a value of .338. Racial discrimination, age, and hopelessness were all negative regressors once again, with coefficients of -0.347, -0.0483, and -0.0400 respectively. However, education was seen as having a statistically significant but practically insignificant value, with a coefficient of 0.000173.

*Table 6: OLS and IV Regression Results of Patient Participation on Confidence in Treatment for Heart Disease Population*

VARIABLES	(1) Patient Confidence (OLS Estimate)	(2) Patient Confidence (OLS Estimate)	(3) Patient Confidence (OLS Estimate)	(4) Patient Confidence (OLS Estimate)	(5) Patient Confidence (OLS Estimate)	(6) Patient Confidence (OLS Estimate)	(7) Patient Confidence (IV Estimate)
Patient Participation	0.621*** (0.0189)	0.621*** (0.00620)	0.620*** (0.00617)	0.619*** (0.00617)	0.621*** (0.00615)	0.621*** (0.00615)	0.638*** (0.00816)
Education		0.552** (0.00111)	0.603** (0.00110)	0.598*** (0.00110)	0.674*** (0.00110)	0.674*** (0.00110)	0.685*** (0.00188)
RBP			-0.166*** (0.00317)	-0.184*** (0.00319)	-0.258*** (0.00617)	-0.258*** (0.00617)	-0.250*** (0.0106)
Male				0.0266*** (0.00514)	0.0211*** (0.00514)	0.0213*** (0.00514)	0.104*** (0.00879)
Age					-0.0378*** (0.00287)	-0.0381*** (0.00288)	-0.000572*** (0.00492)
Hopelessness						-0.00298** (0.00143)	0.00593** (0.00245)
Constant	1.727*** (0.0376)	1.755*** (0.0131)	1.826*** (0.0139)	1.841*** (0.0142)	1.936*** (0.0159)	1.935*** (0.0159)	1.126*** (0.0198)
Observations	1,975	1,975	1,975	1,975	1,975	1,975	1,975
R-squared	0.322	0.323	0.330	0.331	0.336	0.336	0.426

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 6 summarizes the OLS regression for diabetes patients.  $\beta_0$  of the OLS model run with all independent variables is equal to 1.935, meaning this reference group would have a 1.935 CTS on average. Education was a positive regressor, with a value of 0.258. The male dummy variable, while a positive regressor with a value of .0266, was found practically insignificant. In addition, with a value of .00298 and a statistical significance at only the five

percent level, hopelessness is both statistically and practically insignificant. RBP and age were found to be negative regressors, with coefficients of -0.674 and -0.0381 respectively.

Lastly, results from the IV regressions that were done to account for endogeneity within the patient participation regressor can be found in the 7<sup>th</sup> column of Tables 4, 5, and 6, respective to each disease.

The IV estimated patient participation coefficient showed an increase for each disease population in comparison to the OLS generated patient participation coefficients. For the asthma population, this was an increase from an OLS estimate of 0.887 to an IV estimate of 1.171. For the diabetes population, the coefficient increased from 1.078 to 1.217. For the heart disease population, this estimate increased from 0.621 to 0.638. From this, we see how IV regressions resulted in a stronger association between patient participation scores and treatment confidence scores for each disease.

In addition, accounting for this potential endogeneity within our regressor has made noticeable effects on the estimate of age for each disease population. Within each group, this coefficient has decreased by nearly a power of ten. Due to these changes, our understanding of its impact on patient confidence scores also differ. While age remains statistically significant at the 1% level at each disease population, it has become economically insignificant to the confidence outcome in all three diseases. After plotting the residuals of these results against patient participation for the three constructed regression models, the values looked randomly dispersed around the x axis, verifying assumptions of heteroskedasticity and participation as an unbiased estimator.

Accounting for endogeneity made no noticeable impacts on other control variables within any of the three regression models, as magnitude, direction of influence, and statistical significance all remained very similar.

#### Analysis of Primary Study

These three regression models indicate a positive causal relationship between patient participation and patient confidence in treatment, with strength of this relationship varying across each illness. The heart disease patient population had the weakest positive relationship, followed by asthma, and then diabetes with the strongest relationship. Using confidence as a proxy for treatment success, this analysis provides evidence of greater patient participation yielding higher rates of treatment success. These findings demonstrate the positive effects that a collaborative medical approach has on medical care efficacy, answering the initial research question posed by this investigation.

In addition, these findings also indicate many other potential influences of treatment success. For the asthma patient population, gender, RBP, and hopelessness negatively affected treatment success. The diabetes and heart disease patient population followed this same pattern, except hopelessness had no impact on patient confidence in treatment. This tells us that as illness severity increases, mental health metrics such as hopelessness have less of an influence on how confident a patient is in the treatment they receive. In addition, these findings also demonstrate an increasing positive influence of education on patient confidence in treatment as illness severity increases.

Lastly, the differing coefficients observed at each illness severity level indicate this study's preference for one of two alternative hypotheses. In regard to the relationship between patient participation and patient confidence, there are competing theories on how it would

change as illness severity increased. Firstly, it was hypothesized that there would be a more positive relationship between the two as illness severity increased, an idea that is based on patients wanting to have more of a voice during treatments/procedures that could have more adverse effects on their health. A second school of thought was that this relationship would actually decrease in strength, or even become negative, when illness severity increased. This is based on the idea that patients would become more comfortable with “taking a backseat” during treatment planning as a result of the higher consequences that come with poor treatment. Due the coefficient of participation becoming less positive as illness severity increased, it can be said that the assumptions made by this second school of thought were observed, as the relationship was weaker for heart disease and diabetes in comparison to asthma

#### Limitations and Calls for Future Research

There are many potential limitations in this study that must be taken into consideration. Firstly, a possible concern for this study is its lack of external validity, as the sample population used within this survey were all residents of California. With religious views, political perspectives, and healthcare delivery legalities varying from state to state, the amount of patient participation expected of the patient most likely changes as we cross state lines.

In addition, a different proxy verifying these findings would be useful to have as a robustness check. Possible metrics that could be used under these circumstances could be pharmaceutical drug refills, in which the increased refilling of a prescribed medication could indicate treatment success. In addition, another example could be patient readmission rates over a certain period of time, with lower rates indicating higher treatment success.

Also, the 2015 CHIS survey data covers a single point in time. Data that instead follows this cross-sectional data over a timeline (panel data) would be able to provide a clearer picture of

patient participation's effects on treatment success, as it would be able to capture the already well-documented trends of increased participation over the past two decades. This would allow for the comparison of treatment success rates between participation rates of a single individual, providing a more longitudinal picture of causality in terms of outcomes.

Lastly, a different proxy verifying these findings would be useful to have as a robustness check. Possible metrics that could be used under these circumstances could be pharmaceutical drug refills, in which the increased refilling of a prescribed medication could indicate treatment success. In addition, another example could be patient readmission rates over a certain period of time, with lower rates indicating higher treatment success.

Based on these limitations, this study calls for further research to be done on the relationship between patient participation and treatment efficacy in healthcare systems outside of California, as well as with different proxies, in order to see if the trends found in this study remain true. In addition, this study also calls for the use of future studies to utilize panel data when exploring this relationship.

#### Conclusions Derived from Investigation

Following recent shifts in the physician-patient relationship from authoritative to collaborative, this study looked to better understand how such changes influenced treatment efficacy, answering the question: To what extent does the development of the patient-physician relationship from authoritative to collaborative increase patient confidence in treatment plans across a spectrum of illness severity in the state of California?

Using patient confidence as a proxy for treatment success, patient participation was found to have a positive, causal relationship with treatment success at all illness severity levels. Education, gender, and RBP were also found to have strong influences on treatment success,

with the specific effect of each variable dependent upon the illness severity of the patient population. Doing so ultimately allowed this study to illuminate how recent changes in patient participation have influenced the quality of healthcare, helping to fill this gap in the literature.

However, possible questions of external validity, the lack of multiple proxies for treatment success, as well as the limitations that come with only using cross-sectional data are also recognized. As a result, this study calls for future research to explore the effects of patient participation using panel data with different proxies and in healthcare systems outside of California, in order to further strengthen our understanding of the patient-physician relationship.

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