

# Do Patients Have a Gender Preference for Physicians?

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## Abstract

A physician's gender, among other factors, is a consideration of patients' attitudes when selecting a physician or during interactions with the physician. This study aims to understand if there is a gender preference to a different type of physicians among patients, by conducting an online survey with conjoint-analysis style questions, on a much-diversified group all over the country. We build several regression models on 500 survey responses from different angles and including different covariates and interaction terms. We find out that there indeed exists 'gender-preference' when choosing a physician, which depend on the type of physicians.

## Background

There has been ample study on the subject of gender bias in various fields, including the field of healthcare and medical research.

By definition, 'bias' is a strong prejudice towards gender, race, or other characteristics with complete disregard for the person's ability or experience. We experience bias everywhere - from siding unconditionally with our friends and family on important choices and other matters, to choosing our own kind over more able ones when it comes to employment and sometimes extremely important and personal matters where we have to put our lives and health in the care of another person.

There is research on 'instrumental'<sup>[1]</sup> medical specialties such as surgeons and neurologists, as well as on specialities that address concerns specific to a certain gender (such as gynecologists) and intimate psycho-social health programs (primary care physicians). Research shows that this bias affects both patients and physicians.

Biased patients may face more restrictions when looking for new doctors and may not be able to get the most optimal physician or receive medical care promptly when not provided physicians of the preferred gender. Bias also impacts on gender equality in medical training of physicians and

negatively affects inclusiveness of perspectives<sup>[2]</sup>. Biases may be deeply rooted in certain cultures. People may perceive some genders or races to be inferior to others simply because of their unreasonable beliefs carried forward from generation to generation.

A ‘preference’ effect is often less restrictive than bias. Preferences have causes and in most cases are driven by the patient’s level of comfort with a physician of the same gender or opposite gender. This level of comfort might be driven by the patient’s past experiences or personal choice, among other causes.

In this project, we would like to explore the existence of gender preference when choosing physicians, via conducting an online survey and analyzing the results. We would also like to consider different types of physicians as well as the varieties of the patients’ circumstances in our study, which are mentioned from the above research articles.

## **Research Question**

As stated above, the issue of ‘gender-bias’ is a very broad and complex one and would require an in-depth understanding and intuition about social behavior behind it. Furthermore, behavioral traits that help determine gender bias vary from field to field, and it would be difficult to construct an experiment to determine bias with certainty.

We, therefore, restrict our study to understanding a more straightforward effect - that of gender preference in medical professions. While ‘bias’ can be regarded as merit-less selection, ‘preference’ can be regarded as a matter of individual choice.

We argue that there are certain specialties in the medical sciences that have a preferential effect and we can drill down into certain characteristics such as patient age, income, race where some of these effects are more dominant than others.

This study thus aims to determine if a physician’s gender affects patients’ choice to consult with the physician. This research can be thought of as a precursor to a broader question of ‘gender-bias’ in medical professions.

## **Hypothesis**

We hypothesize that there is no gender preference for specialities which are ‘instrumental’ and do not involve extensive medical examination or have no strong stereotypes in popular culture that

top performers are dominated by a certain gender. These are dentists and cardiologists in our survey.

However, we expect some gender concordance with primary care physicians, psychiatrists, and gender-specific physicians (e.g., OBGYN) due to the sensitive examinations and perceived better bedside manner of female physicians.

## Pilot Study

Prior to administering the survey, we conducted a pilot study to test survey design and optimize implementation. We received 42 responses and followed up with in-person feedback from participants.

### Pilot Design

The pilot survey asks participants to select 1 out of 2 physicians described in prose. Each participant is asked three such questions, preceded by seven questions about participants' personal information.

The pilot study aims to make our treatment (gender of the physician) not obvious to the participant; thus the survey starts with a dummy question where both physician descriptions have gender-neutral names and avatars. The true survey questions (following 3) have two physician descriptions of different genders, as indicated by name and avatar.

**Table 1: Pilot Survey**

<b>Platform</b>	SurveyMonkey
<b>Distribution Method</b>	Personal network (email)
<b># of Response Collected</b>	42
<b>Background Questions</b> Collecting participant covariates	7 questions <ul style="list-style-type: none"><li>• States/Location</li><li>• Year of birth</li><li>• Gender</li><li>• Ethnicity</li><li>• Education level</li><li>• Income level</li><li>• Industry</li></ul>
<b>3 Multiple Choice Questions:</b> Pick 1 physician out of 2; both physicians have names	3 questions on primary care physician <ul style="list-style-type: none"><li>• <b>1 Dummy question:</b> choose between 2 gender neutral physicians</li><li>• <b>2 Treatment questions:</b> choose between 1 male and 1 female physician</li></ul>

Below are the examples of the dummy question and treatment question in the pilot survey:

**Figure 1: Dummy question from pilot survey**

\* 8. Based on the below information, who would you want your **Primary Care Provider** to rather be?  
(Click on the picture for your choice)

**Dr. Molly Johnson, MD**, is a family physician. Dr. Johnson received an MD from Johns Hopkins and went on to complete residency and fellowship at Cleveland Clinic Foundation. Following fellowship, Dr. Johnson became board certified and continues pursuing research into "Insulin Resistance from an Interaction Between Pancreatic Islets and Peripheral Tissues". Prior to joining Kaiser Permanente, Dr. Johnson has been in practice for more than 10 years.

**Dr. Kim Lee, MD**, is a family physician. Dr. Lee received an MD from Florida State University and completed a residency at UC Riverside Hospital. Dr. Lee is certified through the American Board of Family Medicine. With nearly 15 years of experience, Dr. Lee's emphasizes preventive medicine and building trusting relationships with patients and helps them take control of their health.



**Figure 2: Treatment question from pilot survey**

\* 9. Based on the below information, who would you want your **Primary Care Provider** to rather be?  
(Click on the picture for your choice)

**Dr. Sofia Garcia, MD**, is a family physician. She received an MD from Harvard medical school and went on to complete residency and fellowship at Massachusetts General Hospital. Following fellowship, Dr. Garcia has been in practice for 15 years. Her philosophy is that "an ounce of prevention is better than a pound of cure". She is certified through the American Board of Family Medicine.

**Dr. Jay Kim, MD**, is a family physician. He received an MD from Stanford medical school and went on to complete residency and fellowship at Mayo Clinic. He's board-certified by the American Board of Family Medicine. Dr. Kim likes to educate patients for an understanding of their wellness to help them be their healthiest. He has been in practice for more than 10 years.



## Learnings from Pilot

1. **Choice of treatment:** focus on just one treatment variable -- gender -- instead of multiple variables. In the pilot, we varied academic prestige, experience, a short description of bedside manner and research. In the survey, we keep all these variables constant.
2. **Readability:** paragraph-style descriptions were too long, so we design concise tables for bullet points for the survey.
3. **Physician name:** remove names to avoid implications of ethnicity and any other temporal effects.

4. **Choice of attributes:** the short description of physician's approach to care was well-received by participants we spoke to, so we expanded this to all physicians in the main survey.
5. **Highlight gender:** reposition avatar relative to text so as to give stronger cues on physician gender. We also colored business cards more clearly to imply gender.
6. **Choice of speciality:** expand to 4-6 specialities as participants said their attentiveness depends on the speciality. They would pay more attention to descriptive cues about doctor's competency for heart surgery vs. common cold.

## Experiment Design

### Experiment Overview

Considering the number of covariates and physician types, the randomization requirement and also the balance between male and female subjects, which would require a large subject set, we choose to stick to using the ‘conjoint analysis’ style questions in our survey, instead of creating a bunch of different versions of surveys and distribute them to control group and treatment group. This means, each subject will answer the same survey (with randomization feature), and the treatment is within each subject - they will choose between different physician profiles or score different physician profile to show their preference.

We evaluate survey platform SurveyMonkey via pilot study as well as Qualtrics within the project team, in terms of their survey design features, randomization features, and survey distribution channels/services. They show different kinds of advantages and shortcomings. We settle on using both platforms: SurveyMonkey to leverage its survey distribution service which is much cheaper than Qualtrics, and paid to get 380 survey results all over the U.S. in two days; Qualtrics for its smarter randomization tools and nature as an academic platform, and sent the survey to our own network. Then we combine the result from the two platforms for further analysis and modeling.

Below is the summary of using the two platforms in our experiment, including timeline, distribution methods, target/achieved response, survey structure.

**Table 2: Survey design and distribution**

		<b>SurveyMonkey</b>	<b>Qualtrics</b>
<b>Distribution Method</b>		SurveyMonkey Audience Service (paid)	Personal network (Facebook, LinkedIn, Email)
<b>Geographic Scope</b>		Within United States	Within United States
# of	Target	380	120

<b>respon sive</b>	<b>Achieved</b>	394	107
<b>Timeline</b>	<b>Survey Setup</b>	July 22 - July 23 2019	July 20 - July 22 2019
	<b>Distribution</b>	July 25 - July 26 2019	July 23 - Aug 1 2019
<b>Survey Link</b>		<a href="https://www.surveymonkey.com/r/F8SZNQY">https://www.surveymonkey.com/r/F8SZNQY</a>	<a href="https://berkeley.qualtrics.com/jfe/form/SV_8ijTFmYlfk8ia8d">https://berkeley.qualtrics.com/jfe/form/SV_8ijTFmYlfk8ia8d</a>
<b>Survey Design</b>  (For details, see Appendix A,B)	<b>Page 1</b>	Welcome Page	Welcome Page
	<b>Page 2</b> Covariate Questions	6 questions <ul style="list-style-type: none"><li>• States/Location</li><li>• Year of birth</li><li>• Gender</li><li>• Race</li><li>• Education level</li><li>• Income level</li></ul>	8 questions <ul style="list-style-type: none"><li>• States/Location</li><li>• Year of birth</li><li>• Gender</li><li>• Race</li><li>• Education level</li><li>• Income level</li><li>• Industry</li><li>• Zipcode</li></ul>
	<b>Page 3- 6</b> Multiple Choice Questions	4 questions <ul style="list-style-type: none"><li>• Primary Care Physician</li><li>• Cardiologist</li><li>• Dentist</li><li>• Psychiatrist</li></ul>	4 questions <ul style="list-style-type: none"><li>• Primary Care Physician</li><li>• Cardiologist</li><li>• Dentist</li><li>• Psychiatrist</li></ul>
	<b>Page 7</b> Scoring Question	N/A	1 questions <ul style="list-style-type: none"><li>• OBGYN or Urologist</li></ul>

## Survey Design

On both survey platforms, the survey started with a welcome page, then followed by a page with all covariates questions in terms of either multiple choice type or text entry type to check (subject's background), which are listed as below:

1. In which state do you currently reside?
2. What is your ZIP code?
3. What is your year of birth?
4. What is your gender?
5. Choose one or more races that you consider yourself to be.
6. What is the highest degree you have received?
7. Which industry are you working in?
8. What is your household annual income before taxes?

Following the collection of subject covariates, the survey asks four multiple choice questions and one scoring question (dependent on subject gender).

## Multiple-Choice Questions

There are four multiple-choice questions for four different types of physicians:

**Primary Care Physician(PCP):** represent the most common type

**Cardiologist:** represent high-skilled specialist and non-gender related

**Dentist:** represent the most common type other than PCP and less gender-sensitive

**Psychiatrist:** represent mental-health related specialty

For each multiple-choice question, we provide four physician profile cards, including below the attributes:

**1) Gender** which we are evaluating, reflected by color-coded avatar to reflect gender (pink/long hair is female, blue/short hair is male). There are two females and two males.

2) To reflect the minimum information needed for patient's review so as to hold the subject's attention, and based on the pilot survey, we identify below the top differentiators of a physician's qualifications and appeal. The information of these attributes are similar but not exactly the same between the four profile cards.

**Medical School / Residency / Board of Certification:** use phrases, to reflect education background based on school and hospital rankings from US News.

**Experience:** number of years to reflect practice history

**Personal Statement:** a paragraph to reflect the personal style

As the pilot study implied, we leave out names or more diversified profile photos in order to eliminate the preference based on the doctor's race and eliminate the misleading information of gender.

Below is an example from the multiple-choice question for Cardiologist.

**Figure 3: Multiple-choice question for cardiologist**

Based on the below information, who would you want your **Cardiologist** to rather be?

 <p>Medical School Harvard Medical School Residency New York-Presbyterian Hospital Board Certifications Interventional Cardiology Experience 25 years  Personal Statement I believe in equality with my patients and support them to become equal partners with me in the management of their condition.</p>	 <p>Medical School University of Pennsylvania Residency Cedars-Sinai Medical Center (Los Angeles) Board Certifications Cardiovascular Disease Experience 22 years  Personal Statement I value patient empowerment in my treatment process. I want to help people gain control over their own lives.</p>
 <p>Medical School Harvard Medical School Residency Massachusetts General Hospital Board Certifications Cardiovascular Disease Experience 27 years  Personal Statement I truly believe that the doctor-patient relationship is built on trust and good communication.</p>	 <p>Medical School Stanford Medical School Residency Mayo Clinic Board Certifications Minimally Invasive Surgery Experience 25 years  Personal Statement In my practice, I will make an effort to educate you about your condition, treatment and medication so that you are empowered to participate in your own medical health.</p>

## Scoring Questions

The scoring question is designed for the gender-specific type of physicians. If the subject selects ‘Female’ in the covariate question, the subject will be asked to score an OBGYN doctor; if the subject selects ‘Male’, the subject will be asked to score a Urologist.

Below is an example from the scoring question for an OBGYN doctor.

**Figure 4: Scoring question for OBGYN doctor**

Based on the below information, please assign a score to below **OBGYNs (Obstetrics and Gynecology)**?  
100 means you **absolutely like** that doctor to be your OBGYN. 0 means you **don't want** that doctor to be your OBGYN at all.

0      10      20      30      40      50      60      70      80      90      100

	<p>Medical School UC Irvine School of Medicine</p> <p>Residency University of California San Francisco</p> <p>Board Certifications Obstetrics and Gynecology</p> <p>Experience 14 Years</p> <p>Personal Statement Be professional, focus on patient education and make sure the patient learns what they need to know and feel comfortable with the treatment.</p>
	<p>Medical School University of California, Los Angeles</p> <p>Residency Stanford University</p> <p>Board Certifications Obstetrics and Gynecology</p> <p>Experience 13 Years</p> <p>Personal Statement Communication is the most important thing. My goal is to make women feel comfortable with their bodies and health choices.</p>
	<p>Medical School UCSF School of Medicine</p> <p>Residency UCSF School of Medicine</p> <p>Board Certifications Obstetrics and Gynecology</p> <p>Experience 12 Years</p> <p>Personal Statement Collaborative decision could lead to the best treatment result.</p>
	<p>Medical School Washington University School of Medicine</p> <p>Residency Pennsylvania Hospital, University of Pennsylvania</p> <p>Board Certifications Obstetrics and Gynecology</p> <p>Experience 13 Years</p> <p>Personal Statement To make women feel comfortable to share information and their health choices.</p>

## Randomization

### Within the Survey

We leverage all the randomization features available on the survey platform, e.g., randomly select four profile cards from the library and also randomize the order of four cards, randomize the order of the questions. This will help to reduce the chance of pattern-seeking from the subjects which might cause the subjects to choose a doctor not based on their original thought or instinct. It can also alleviate the tediousness by seeing the same type of questions repeatedly.

Qualtrics is much more flexible than SurveyMonkey to realize all these randomize features.

## Distributing the Survey

We don't have many concerns about the balance between treatment and control group because our experiment is a within-subject treatment, which means each subject is treated. However, we do consider the gender preference might be related to the covariates we selected, especially the gender of the subjects themselves, so we need to balance the types of subjects which covariates show and avoid having survey responses concentrated in one or a few certain groups of people.

The paid SurveyMonkey Audience Service allows us to keep gender and age balance by matching U.S. census distribution. However, we sent Qualtrics to our own network, which might bear a certain level of imbalance of subjects who are more similar to ourselves.

Below is a summary of the randomization features used in our experiment using the two survey platforms.

**Table 3: Randomization on the two platforms**

	<b>SurveyMonkey</b>	<b>Qualtrics</b>
<b>Within Each Questions:</b> Randomize the order of all choices	Yes	Yes
<b>Within Each Questions:</b> Randomize profile selection from library	No	Yes
<b>Between Questions:</b> Randomize order the order of questions	No	Yes
<b>Subjects:</b> Evenly distributed within blocks	<ul style="list-style-type: none"><li>• <b>Gender:</b> reflect the gender distribution in census data.</li><li>• <b>Ages:</b> reflect the age distribution in census data across these brackets: 18–44 and 45+</li><li>• <b>Geographic:</b> all states are covered</li><li>• <b>Income:</b> all income ranges are covered</li></ul>	No

## Observations and Compliance Check

We successfully collect 394 completed response from SurveyMonkey and 107 completed response from Qualtrics. After combining the data downloaded from the two survey platform, we are able to construct the experiment observation data with 501 records.

Below is the observation data format along with an example from Qualtrics:

**Table 4: Survey observation format**

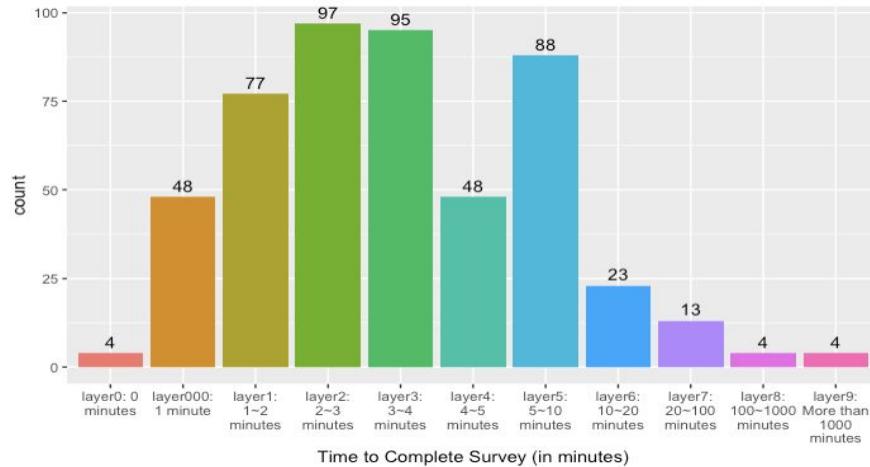
Field Name	Description	Example from Qualtrics	Notes
<b>channel</b>	Survey platform name	Qualtrics	<b>Info of the Survey Completion</b>
<b>respondent_id</b>	Unique response/subject id	QUAL<<R_3I4C2Ew9laquy8d>>	
<b>start_date</b>	Date time when survey starts	2019-07-26 00:34:35	
<b>end_date</b>	Date time of submission	2019-07-26 00:39:53	
<b>us_state</b>	State location of the subject	California	<b>Covariates Questions Result</b>
<b>year_of_birth</b>	Year of birth of the subject	1990	
<b>gender</b>	Gender of the subject	Male	
<b>race</b>	Race of the subject	Asian / Pacific Islander	
<b>income</b>	Annual income range of the subject	\$200,000 or more	<b>Multiple Choice Questions Result (four questions)</b>
<b>degree</b>	Highest degree of the subject	Master's Degree	
<b>pcp</b>	Gender of the selected PCP doctor selected	Female	
<b>cardiologist</b>	Gender of the selected cardiologist	Male	
<b>psychiatrist</b>	Gender of the selected psychiatrist	Female	<b>Scoring Questions result (1 scoring question, to score four profile)</b>
<b>dentist</b>	Gender of the selected dentist	Female	
<b>gender_specific_physician 1/2/3/4</b>	Gender of UBGYN/Urologist being scored (4 of them)	Female	
<b>gender_specific_score 1/2/3/4</b>	Score of UBGYN/Urologist being scored (4 of them)	94	
<b>duration_min_categorical</b>	How many minutes the subject took to complete the survey (in minutes), derived from end_date-start_date	layer5: 5~10 minutes	<b>Covariates Questions Result (derived)</b>
<b>age_range</b>	Age group of the subject, derived from year_of_birth	18~29	

We perform two compliance checks.

1. One is to consider the completeness of the survey. Since we set ‘Force Response’ and ‘Quality Check’ features in our survey, the quality of the answers are really good and confirmed by double-checking from the combined dataset.

2. The other check is to how much time the subject takes to complete the survey. We consider the survey could be done within 5 minutes. Figure 5 below is the distribution of the time used by the responses:

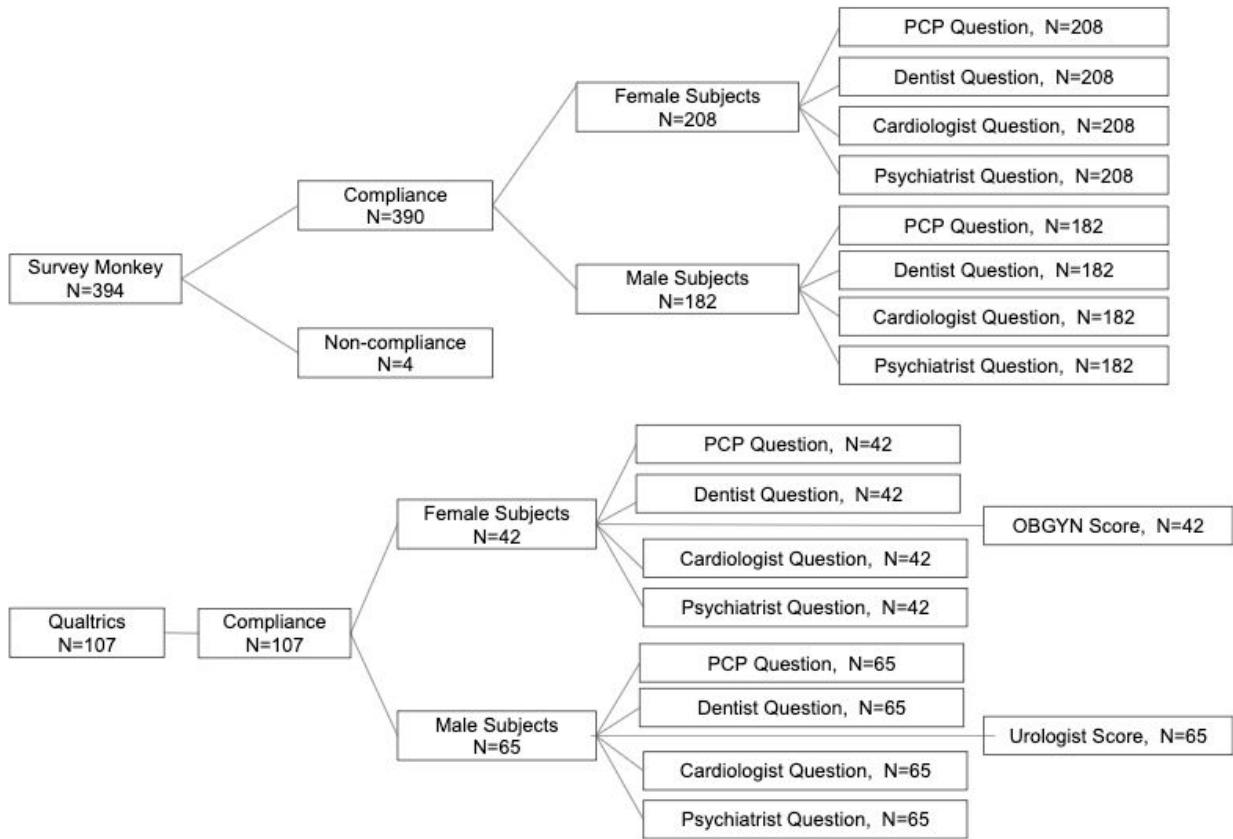
**Figure 5: Histogram of time taken to complete survey**



- **Zero minutes:** there are also response taking a very short time. There are four responses taking ZERO minutes, which are from SurveyMonkey and the timestamp only accurate to minutes (no second), we consider they are non-compliance and need to be removed before building the model.
- **One minute:** There are 48 response taking one minute which are from SurveyMonkey and the timestamp only accurate to minutes (no second), so the real-time of these responses should be greater than zero and less than one minutes, we consider they are type of patients who don't really care about the physician profile or don't really care about the information shown in the profile card(i.e., they might care about other attributes, e.g., rating or price) so that they quickly select one physician. So we consider these responses are compliant.
- **Between 1 to 5 minutes:** they are within a reasonable and expected time, which are compliance response.
- **Longer than 5 minutes:** either slightly longer for thorough choices, or very long because leaving the survey site and coming back later, all of which we consider as legitimate response with compliance.

To summarize the final observations after compliance, Figure 6 below is a flow chart of observation and treatment-delivery of the whole experiment.

**Figure 6: flow chart of treatment delivery**



## Outcome Measures

We can interpret the outcome measures in a number of ways but we will proceed with analysis using one of these after describing the implications.

We score each choice made by a participant for each speciality the participant is asked to select the physician for. We then introduce a dummy variable called *isFemale* which is 1 if participant *i* chooses a Female physician, 0 otherwise.

i.e. if  $A = \text{list of all participants}$ , then for  $i \in A$ ,

$$Y_{ip} = 1 \text{ if } \text{a physician } p \text{ selected by subject } i \text{ is Female, 0 otherwise} \quad (1)$$

This data can be aggregated so that we can count the number of Female physicians per participant. i.e.

$$Y_i = \text{Number of female physicians chosen by subject } i = \sum_p Y_{ip} \quad (2)$$

**Table 5: Calculating  $Y_i$  for female physician count**

<b>For each subject i &amp; chosen physician j</b>	
1	If physician j is female
0	otherwise

Because each participant is mandatorily asked to choose 4 physicians, under the context of the experiment,  $Y_i$  can have a maximum value of 4 (all 4 physicians chosen by 1 subject are female) and a minimum value of 0 (all 4 physicians chosen by 1 subject are male).

Table 6 gives an example.

**Table 6: Example calculating  $Y_i$  for female physician count**

<b>Subject</b>	<b>Gender of the chosen physician</b>				<b>Total score for subject</b>
	<b>PCP Gender</b>	<b>Cardiologist Gender</b>	<b>Dentist Gender</b>	<b>Psychiatrist Gender</b>	
1	Female	Female	Female	Female	4
2	Female	Male	Female	Male	2

We will also explore the implications of measuring the outcomes with a slightly different perspective where we ‘encode’ the gender of the subject and the gender of the physician within the outcome variable.

Under this approach, if both genders are the same, we assign a score of +1 to a subject-physician combination, -1 otherwise.

i.e. if  $A = \text{list of all participants}$ , then for  $i \in A$ ,

$$Y_{ip} = +1 \text{ if}$$

*a physician p selected by subject i's gender is the same as a physician's gender, -1 otherwise*

$$(2.1)$$

**Table 7: Calculating  $Y_i$  for gender concordance between subject and physician**

<b>For each subject i &amp; chosen physician j</b>	
+1	If subject i has the same gender as physician j
-1	If subject i has the opposite gender as physician j

Similar to the counts approach above, this data can be aggregated, so that for one subject, we can have a maximum score of +4 if all physicians chosen by the subject have the same gender as the subject and a minimum score of -4 if none of the physicians chosen by the subject.

**Table 8: Possible outcome measures for each subject**

Outcome per subject	Which means	Indicating
+4	if all physicians chosen by the participant have the same gender as the gender of the participant	a very strong "same gender" preference
+2	if 3 physicians chosen by the participant have the same gender as the participant but 1 has a different gender	a somewhat strong "same gender" preference
0	if 2 physicians chosen by the participant have the same gender as the participant but 2 have a different gender	a net neutral preference
-2	if 1 physician chosen by the participant have the same gender as the participant but 3 have a different gender	a somewhat strong "opposite gender" preference
-4	if none of the physicians chosen by the participant have the same as the gender of the participant	a very strong "opposite gender" preference

As described above, the experiment also allows subjects to score physicians related to gender-specific specialities. Male subjects are asked to score four urologists of whom two male and two are female. Similarly, Female subjects are asked to score OB/GYN of whom two are male and two are female.

The outcome measures, in this case, are simply the percentage of total score for female doctors.

i.e. if  $A = \text{list of all participants}$ , then for  $i \in A$ ,

$$Y_{i-\text{gender-specific}} =$$

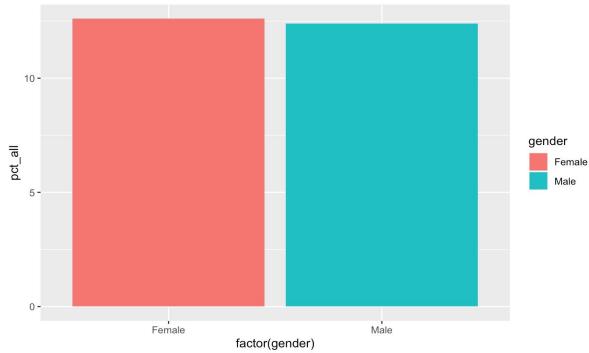
$$\text{Total score for male physicians} - \text{Total score for female physicians} \quad (2.2)$$

# Results

## Exploratory Data Analysis

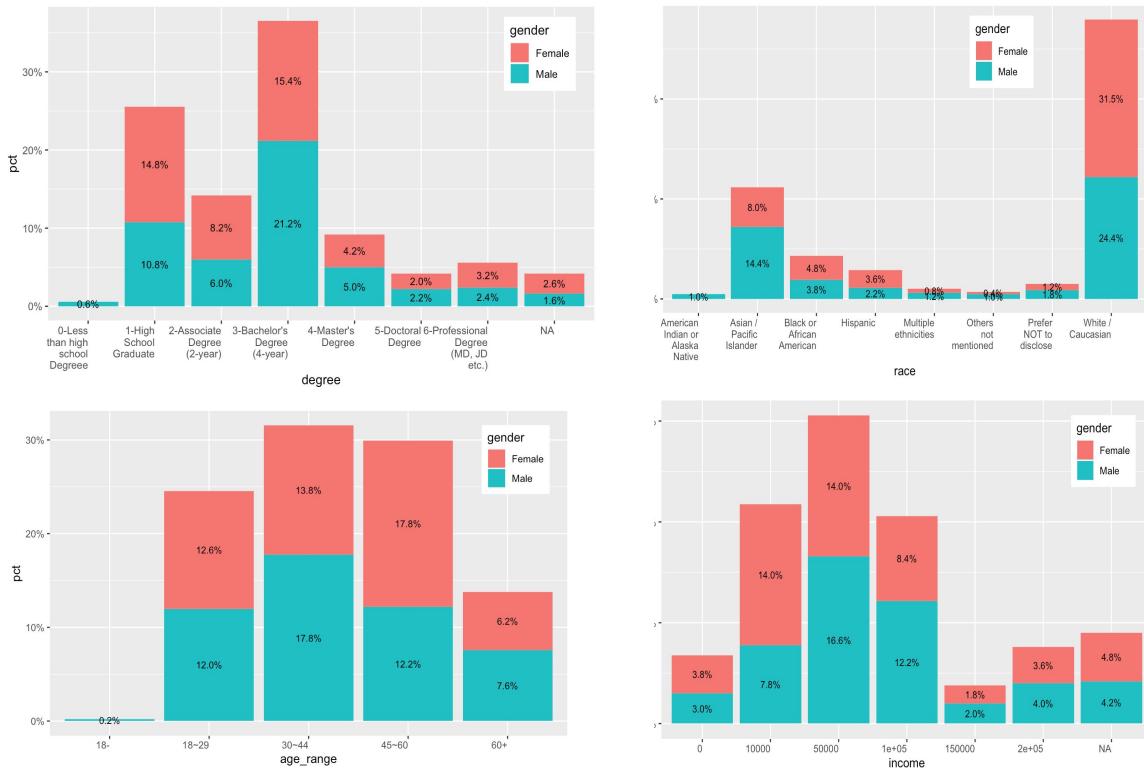
Because our study is based on subject and physician gender, we check that we have a good balance between male and female subjects, see Figure 7.

**Figure 7: Distribution of subjects by gender**



We also verify that we have a good balance in the gender across all other covariates in Figure 8.

**Figure 8: Distribution of other covariates by gender**



This confirms that we can perform regression analysis where considering subject gender as our independent variable and also study interaction effects between this covariate and other covariates like age, race, degree, and income.

## Primary Observations

The Average Treatment Effect as defined by the mean of outcomes is 2.234 overall observations, which proves that there is some gender preferential effect across the sample in the experiment.

As an initial measure, we show the distribution of counts by the number of subjects. This gives us an idea of any skewness in the outcome variable defined in eqn (2) above. Note that the maximum number of physicians a subject can choose is 4.

**Figure 9: Distribution of female physicians**

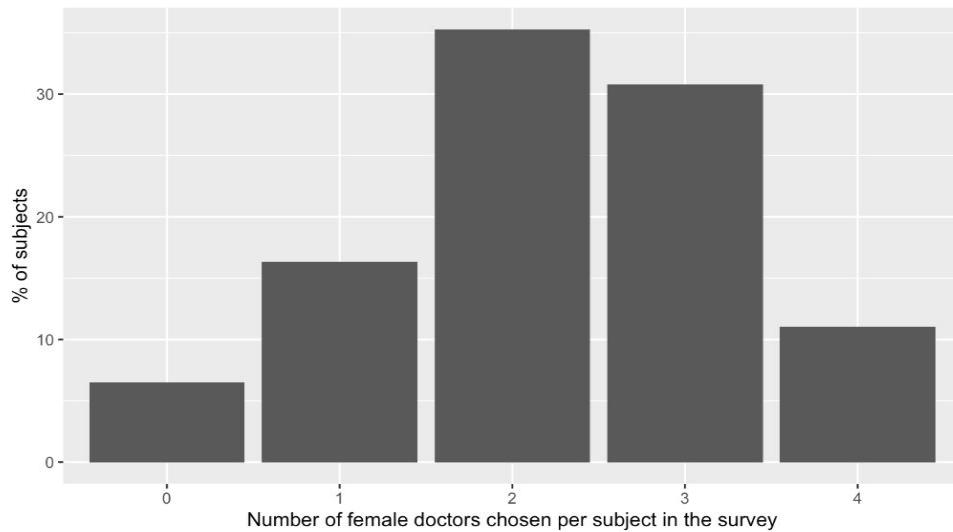
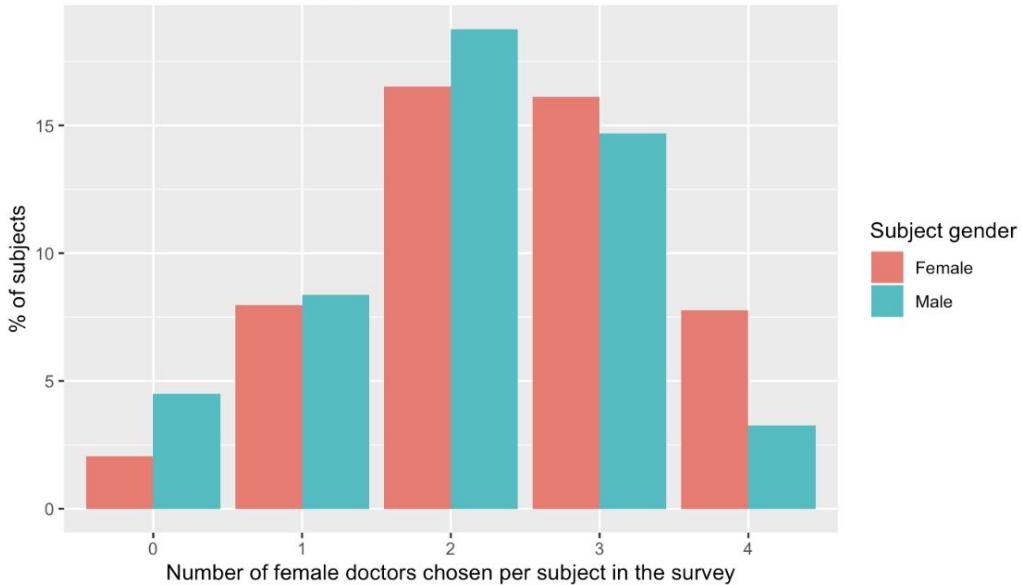


Figure 9 above shows that while about 35% of the subjects chose two female doctors and two male doctors, about 12% of the respondents had a strong preference for female doctors and about 31% of respondents had a “somewhat strong” preference for female doctors.

We then split the percentages into those relevant for male subjects and female subjects. These splits are shown in Figure 10 below.

**Figure 10: Distribution of female physician count**



The figure above shows a slight skew (rightmost bin with value = 4) in the number of female subjects showing a strong preference towards female physicians. This number is about 7.5% for females as compared to about 3.2% for male subjects.

Towards the left side of the graph above (leftmost bin with value = 0), we see the same preference towards male physicians. i.e., about 4.5% for male subjects and about 2% for female subjects.

The table below summarizes these results clearly:

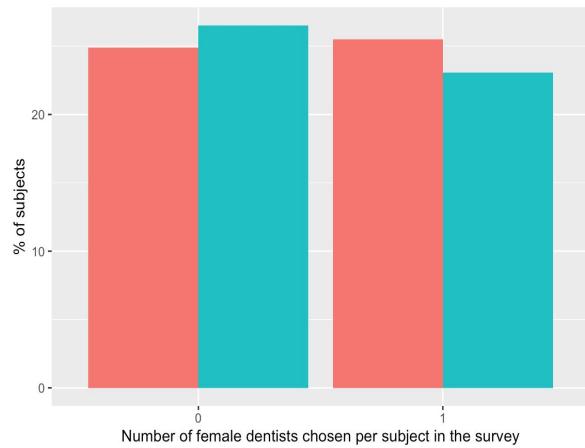
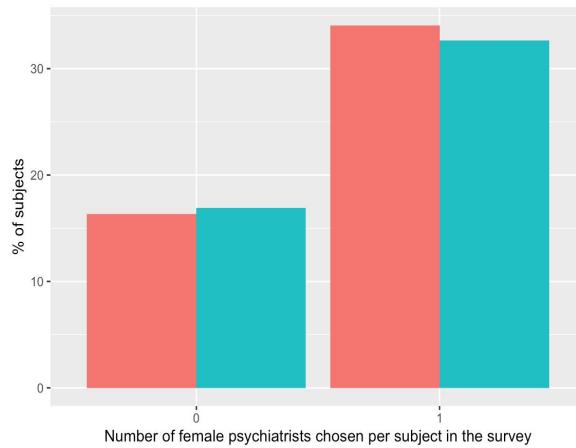
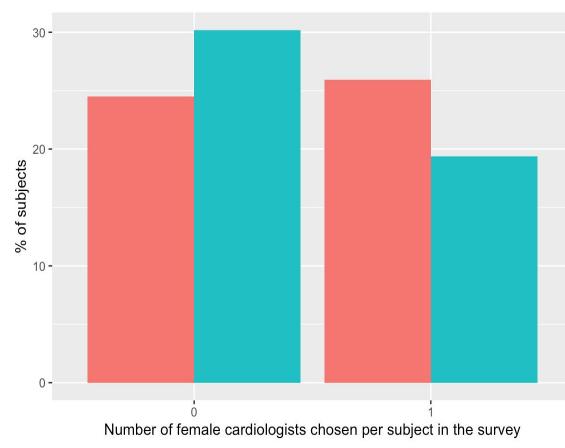
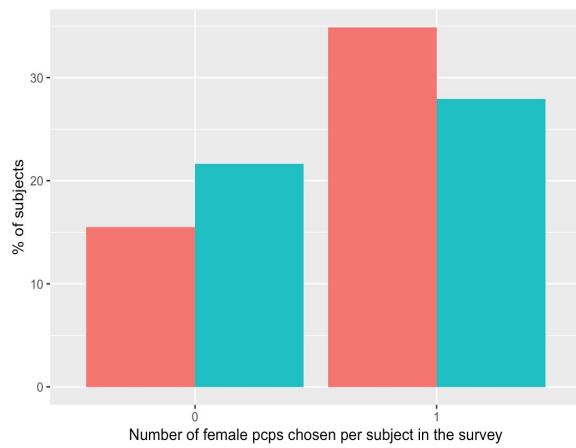
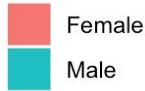
**Table 9: Possible outcome measures for each subject**

Subject gender	% of subjects choosing 0,1,2,3 or 4 female physicians				
	0	1	2	3	4
Male	4.5	8.3	18.7	14.6	3.2
Female	2	7.9	16.5	16.1	7.5

While these results show the break up of overall physician gender preferences by subject gender, we further investigate if some of these choices are driven by the specialty of the doctor. We therefore split these numbers further, as shown in Figure 11 below.

**Figure 11: Distribution of female physician count**

Subject gender



Each panel in the figure above shows the distribution of the count of female doctors chosen by % of respondents split by the gender of the respondent. Zero female doctors chosen implies that a male doctor has been chosen.

While there is an almost equal number of males and females have chosen dentists of both genders, there is definitely a higher preference towards female psychiatrists amongst both male and female subjects. This effect is not as strong for cardiologists and PCPs. In both these cases, male subjects

seem to marginally prefer male doctors and female subjects seem to prefer female doctors marginally.

## Regression Models

We develop one basic model, two interaction-term models, one gender-specific specialty model, and several other interaction model(interactions between covariates). Below are the details.

### Basic Model - Effect of Subject Gender on Outcome

Our basic regression model studies the effect of subject gender on the outcome. The dependent variable is  $Y_i$  (female doctor score per subject with a max of 4) as defined in eqn (2.1) and the model is

$$Y_i = \beta_0 + \beta_1 G_i \text{ where } G_i = \text{gender of subject } i \quad (3.1)$$

With this model, we see a statistically significant effect of -0.310 if the gender of the subject is Male than if the gender is Female which means that on an average, a Male subject's score for a female doctor is 0.310 less than a Female subject's score for a female doctor. The outcome for a Male subject is, therefore  $2.2389 - 0.310 = 2.07$  and the outcome for a Female subject is 2.389.

=====	
Dependent variable:	
-----	
	Y_4spec_female
-----	
genderMale	-0.310*** (0.095) p-value = 0.00112
-----	
Constant	2.389*** (0.067) p-value < 2e-16
-----	
Observations	490
R2	0.022
Adjusted R2	0.020
Residual Std. Error	1.048 (df = 488)
F Statistic	10.746*** (df = 1; 488)
=====	
Note:	*p<0.1; **p<0.05; ***p<0.01

However, this model does not give us the interaction effect between the gender of the subject and the gender of the physician. We therefore change the model parameters so that we get this interaction effect.

We look at two ways of building interaction between the subject gender and physician gender. The first model uses the outcome variable for each subject-physician combination (with possible values of 0 and 1) and uses this dependent variable on both sides of the regression.

### **Interaction Model 1 - Interaction Between Subject Gender and Physician Gender Using the Outcome Variable as a Part of the Interaction.**

The regression for this model is shown below in eqn (3.2)

$$Y_{i-\text{interaction-model-1}} = \beta_0 + \beta_1(Y_{i-\text{interaction-model-1}}) + \beta_2(\text{isFemale}) + \beta_3(Y_{i-\text{interaction-model-1}} \text{isFemale}) \quad (3.2)$$

=====	
Dependent variable:	
-----	
	Y_if_female
-----	
isfemale	-0.520*** (0.021)
Y_if_female:isfemale	1.000*** (0.023)
-----	
Constant	0.520*** (0.011)
-----	
Observations	1,960
R2	0.498
Adjusted R2	0.497
Residual Std. Error	0.352 (df = 1957)
F Statistic	970.415*** (df = 2; 1957)
=====	
Note:	*p<0.1; **p<0.05; ***p<0.01

The effect of being a female subject as per this model is -0.52. This proves that the overall treatment effect for a male subject is different than for a female subject when interacted with the gender of the doctor chosen.

## **Interaction model 2 - Interaction Between Subject Gender and Physician Gender by Encoding the Outcome Variable with the Subject Gender.**

A slightly different way of showing an interaction between the subject gender and the physician gender is as shown in eqn (2.1), Table 7 and Table 8. The overall model in this case looks like:

$$Y_{i-\text{interaction-model-2}} = \beta_0 + \beta_1 G_i \text{ where } G_i = \text{gender of subject } i \quad (3.3)$$

Here the dependent variable has 5 possible values as shown in Table 8 - -4, -2, 0, +2 and +4.

The results of the regression are as follows:

=====	
Dependent variable:	
-----	
	Y_1
-----	
genderMale	-0.934*** (0.189) p-value=1.13e-06
Constant	0.777*** (0.133) p-value=1.02e-08
-----	
Observations	490
R2	0.047
Adjusted R2	0.045
Residual Std. Error	2.096 (df = 488)
F Statistic	24.297*** (df = 1; 488)
=====	
Note:	*p<0.1; **p<0.05; ***p<0.01

We see a significant effect of -0.934 when the subject is a male with an outcome of (-0.934 + 0.777) = -0.157 and an outcome of 0.777 when the subject is a female. Both these non-zero outcomes prove that both male and female subjects, there is some gender preference on an average. For females, the preference leans towards female physicians, and for males too, the preference leans towards female physicians.

Note that the model above can be regressed on the type of physician as well to understand specialty effects.

### **Gender-Specific Specialty Model - Urology (for males) and OB/GYN (for females)**

The model below uses the scoring instructions used in eqn (2.2). Within each subject, the two female physician's individual scores are added, and the result is subtracted from the total of the two male physician's individual scores.

This implies that if a positive score is associated with a subject, their net male physician score is higher than their net female physician score, and so the subject prefers a male physician over a female physician. Also, the score itself is indicative of the extent of physician gender preference by the subject.

The model is as below:

$$Y_{i\text{-gender-specific}} = \beta_0 + \beta_1 G_i \text{ where } G_i \text{ is the gender of the subject} \quad (3.4)$$

=====	
Dependent variable:	
-----	
Y_specific	
-----	
genderMale	44.187*** (10.471)
Constant	-40.571*** (8.161)
Observations	107
R2	0.145
Adjusted R2	0.137
Residual Std. Error	52.891 (df = 105)
F Statistic	17.807*** (df = 1; 105)
=====	
Note:	*p<0.1; **p<0.05; ***p<0.01

As we see from the table above, the preference towards a female physician as an OB/GYN is extremely high (about -40.5). This is interpreted from the fact that the score is negative and the value is extremely high.

The same does not apply for male subjects. It appears that, while the outcome score for male subjects is positive ( $44.187 - 40.571 = 3.61$ ), the score itself is not very high indicating that while males subjects do prefer male physicians, the preference effect is very low.

## Other Interactions

We also interact with the gender of the subject with other gender parameters (like income, age, race, and education levels). We only present the ones that gave us some statistically significant effects. In all the below regressions, we use the outcome as was defined in Table 7 and Table 8.

- **Interaction of gender and income**

$$Y_i = \beta_0 + \beta_1 G_i + \beta_2 I_i + \beta_3 G_i I_i \text{ where } G_i = \text{gender of subject } i \text{ and } I_i = \text{income of subject } i$$

This model gives us a significant effect of 0.85 on subjects whose income is less than \$10,000 and effect of -1.46 on subjects whose income is less than \$10,000 and whose gender is Male.

The regression result could be found in Appendix C.b.

- **Interaction of gender and race**

$$Y_i = \beta_0 + \beta_1 G_i + \beta_2 R_i + \beta_3 G_i R_i \text{ where } G_i = \text{gender of subject } i \text{ and } R_i = \text{race of subject } i$$

The only significant effect here is on Asian/Pacific Islander race (-1.05) and their interaction with gender (1.5).

The regression result could be found in Appendix C.c.

Additionally, Appendix C.a and C.d show regression result for the interaction of gender and education, and interaction of gender and age, respectively.

## Conclusion

Overall, it appears that there is a gender preference among subjects, and this preference effect varies across specialties; therefore we reject our hypothesis. While both male and female subjects prefer female psychiatrists, there is no such preference for dentists.

We also see that female subjects prefer female OB/GYNs with a much higher preferential effect than males choose male Urologists.

This survey attempts to find some gender preference by asking subjects to choose between male and female doctors through the use of a scoring mechanism. However, the study does not attempt to establish any gender bias in the medical professions. We pay special attention to the way we have designed the survey so that the subject gets an extremely visual distinction between male & female physicians keeping all other physician factors almost constant.

It has also been argued recently that gender preference in medical professions is expected because of “cross-gender embarrassment.” However, such effects are hard to measure, and so we can only conclude that the gender-choice of a doctor is a result of personal preference and past experiences.

## References

- 1 Kerssens, J. J., Bensing, J. M., & Andela, M. G. (1997, May). Patient preference for genders of health professionals. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/9160442>
- 2 Cil1, T. D., & Easson, A. M. (2018, July 9). The role of gender in patient preference for breast surgical care – a comment on equality. Retrieved from <https://ijhpr.biomedcentral.com/articles/10.1186/s13584-018-0231-2>
- 3 Amir H, Beri A, Yechiely R, Amir Levy Y, Shimonov M, Groutz A. Do urology male patients prefer same-gender urologist? Am J Mens Health. 2016. Retrieved from <https://doi.org/10.1177/1557988316650886>.
- 4 (2019, May 19). How Does Gender Factor In When Patients Choose Doctors? Retrieved from <https://thescript.zocdoc.com/do-women-prefer-female-doctors-it-depends/>

# Appendix

## A. Screenshots of the SurveyMonkey Survey



### Choose-a-doctor

#### Welcome to Our Survey

We are students in UC Berkeley School of Information. We are conducting this survey for a study on highly-qualified physician profile.

The survey includes 10 questions and will take around 5 minutes to complete.

**Disclaimer:** the data we collect from this survey is **anonymous** and will **only** be used in academic study. We will **NOT** ask, trace, or record your real identity in this survey.

Thank you for your participation. Your feedback is important.

OK

## Choose-a-doctor

\* 1. In what state or U.S. territory do you currently reside?

\* 2. What is your year of birth?

\* 3. What is your gender?

- Female
- Male

\* 4. Which race/ethnicity best describes you? (Please choose only one.)

- American Indian or Alaskan Native
- Asian / Pacific Islander
- Black or African American
- Hispanic
- White / Caucasian
- Multiple ethnicities
- Others not mentioned
- Prefer not to disclose

\* 5. What is your household income before taxes?

- Less than \$10,000
- \$10,000 to \$49,999
- \$50,000 and \$99,999
- \$150,000 to \$199,999
- \$200,000 or more
- Prefer NOT to disclose

ce View  \$149,999

## Choose-a-doctor

- \* 7. Based on the below information, who would you want your **Primary Care Provider** to rather be?  
 (Click on the picture for your choice)



**Medical School**  
Columbia University  
**Residency**  
UCSF Medical Center, San Francisco  
**Experience**  
13 years Internal Medicine  
**Board Certifications**

**Personal Statement:**  
I always strive to keep an open-minded approach to meet patients where they are and believe there isn't a one-size-fits-all solution.



**Medical School**  
University of California - San Francisco  
**Residency**  
UCLA Medical Center, Los Angeles  
**Experience**  
15 years Internal Medicine  
**Board Certifications**

**Personal Statement:**  
I emphasize a compassionate approach to treatment options and will always listen to your concerns.



**Medical School**  
University of Pennsylvania (Perelman)  
**Residency**  
Cleveland Clinic  
**Experience**  
15 years Internal Medicine  
**Board Certifications**

**Personal Statement:**  
I take a team approach to medicine by always listening and collaborating with my patients.

Device View




education are key for me, with an emphasis on evidence-based medicine.

?

Survey Format



**Medical School**  
Harvard Medical School  
**Residency**  
Johns Hopkins Hospital, Baltimore  
**Experience**  
25 years Internal Medicine  
**Board Certifications**

**Personal Statement:**  
education are key for me, with an emphasis on evidence-based medicine.

?

## Choose-a-doctor

- \* 8. Based on the below information, who would you want your **Cardiologist** to rather be?  
 (Click on the picture for your choice)



**Medical School**  
Harvard Medical School  
**Residency**  
Massachusetts General Hospital  
**Experience**  
27 years Cardiovascular Disease  
**Board Certifications**

**Personal Statement:**  
I truly believe that the doctor-patient relationship is built on trust and good communication.



**Medical School**  
University of Pennsylvania  
**Residency**  
Cedars-Sinai Medical Center (Los Angeles)  
**Experience**  
22 years Cardiovascular Disease  
**Board Certifications**

**Personal Statement:**  
I value patient empowerment in my treatment process. I want to help people gain control over their own lives.



**Medical School**  
Johns Hopkins University  
**Residency**  
Cedars-Sinai Medical Center (Los Angeles)  
**Experience**  
20 years Interventional Cardiology  
**Board Certifications**

**Personal Statement:**  
I let my patients lead the way I counsel them. My patients will be able to increase their capacity to act on issues that they themselves define as important.



**Medical School**  
University of California - San Francisco  
**Residency**  
Cleveland Clinic  
**Experience**  
25 years Interventional Cardiology  
**Board Certifications**

**Personal Statement:**  
I take the time to hear your concerns and treat you as a person — not a diagnosis.

?

View 

Prev

Next

Survey Format

## Choose-a-doctor

\* 9. Based on the below information, who would you want your **Dentist** to rather be?  
(Click on the picture for your choice)

	Dental School Harvard School of Dental Medicine
Residency	Stanford Hospital
Experience	Board Certifications
20 years	Oral and Maxillofacial Surgery
Personal Statement	
My philosophy is that "an ounce of prevention is better than a pound of cure."	

	Dental School University of California San Francisco (UCSF) School of Dentistry
Residency	UCSF Medical Center, San Francisco
Experience	Board Certifications
22 years	General Dentistry
Personal Statement	
I am proactive with patients, talking to them about different aspects of their lives that affect their health.	

	Dental School University of North Carolina Chapel Hill School of Dentistry
Residency	NewYork-Presbyterian Hospital
Experience	Board Certifications
21 years	General Dentistry
Personal Statement	
I treat my patients' current concerns and also educate them about good practices to prevent future issues too.	

	Dental School The University of California Los Angeles School of Dentistry
Residency	Massachusetts General Hospital
Experience	Board Certifications
20 years	Oral and Maxillofacial Surgery
Personal Statement	
I constantly update my skills to counsel patients about lifestyle and behavior interventions.	

View   

Prev Next

Survey Form

## Choose-a-doctor

\* 10. Based on the below information, who would you want your **Psychiatrist** to rather be?  
(Click on the picture for your choice)

	Medical School Johns Hopkins University
Residency	Stanford Health Care
Experience	Board Certifications
21 years	Psychiatry
Personal Statement	
I am committed to delivering patient-centered outcomes through providing most updated scientific data and presenting all options fairly to patients.	

	Medical School Duke University of Medicine
Residency	University of California - San Francisco
Experience	Board Certifications
27 years	Clinical Neurophysiology
Personal Statement	
I believe that patients need to be involved in designing more effective treatment and I tailor my approach to my patients' needs.	

	Medical School Perelman School of Medicine at the University of Pennsylvania
Residency	NewYork-Presbyterian Hospital
Experience	Board Certifications
25 years	Addiction Psychiatry
Personal Statement	
I like to help my patients understand the important role they have in managing their own health challenges by taking time to understand their needs.	

	Medical School Harvard Medical School
Residency	Massachusetts General Hospital
Experience	Board Certifications
29 years	Psychiatry
Personal Statement	
Through active listening, I am able to provide compassionate, patient-centered care.	

View   

Prev Next

Survey Form

## B. Screenshots of the Qualtrics Survey



### Welcome to Our Survey

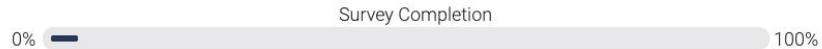
We are students in UC Berkeley School of Information. We are conducting this survey for a study on highly-qualified physician profile.

The survey includes **13** questions and will take you around **5** minutes to complete.

**Disclaimer:** the data we collect from this survey is entirely **anonymous** and will **only** be used in academic study. We will **NOT** ask, trace, or record your real identity in this survey.

Thank you for your participation. Your feedback is important.





In which state do you currently reside?

What is your ZIP code?

What is your year of birth?

What is your gender?

Female

Male

Choose one or more races that you consider yourself to be:

American Indian or Alaska Native

Asian / Pacific Islander

Black or African American

Hispanic

White / Caucasian

Multiple ethnicities

Others not mentioned above

Prefer NOT to disclose

# Berkeley

UNIVERSITY OF CALIFORNIA

Based on the below information, who would you want your **Primary Care Provider** to rather be?

	<b>Medical School</b> University of North Carolina--Chapel Hill <b>Residency</b> Massachusetts General Hospital <b>Board Certifications</b> Internal Medicine <b>Experience</b> 18 years  <b>Personal Statement</b> My exam room is a judgment-free, open-minded zone, and I want my patients to feel like they can talk to me about anything without feeling judged.
	<b>Medical School</b> Washington University in St. Louis <b>Residency</b> Mayo Clinic <b>Board Certifications</b> Internal Medicine <b>Experience</b> 12 years  <b>Personal Statement</b> I believe in active listening and mutual respect so that I truly understand my patients. To me, these are vital parts of a successful patient-provider relationship.
	<b>Medical School</b> University of California - San Francisco <b>Residency</b> UCLA Medical Center, Los Angeles <b>Board Certifications</b> Internal Medicine <b>Experience</b> 15 years  <b>Personal Statement</b> I emphasize a compassionate approach to treatment options and will always listen to your concerns.
	<b>Medical School</b> University of Pennsylvania (Perelman) <b>Residency</b> Cleveland Clinic <b>Board Certifications</b> Internal Medicine <b>Experience</b> 15 years  <b>Personal Statement</b> I take a team approach to medicine by always listening and collaborating with my patients.



# Berkeley

UNIVERSITY OF CALIFORNIA

Based on the below information, who would you want your **Cardiologist** to rather be?

	<b>Medical School</b> University of California - San Francisco <b>Residency</b> Cleveland Clinic <b>Board Certifications</b> Interventional Cardiology <b>Experience</b> 25 years  <b>Personal Statement</b> I take the time to hear your concerns and treat you as a person — not a diagnosis.
	<b>Medical School</b> Johns Hopkins University <b>Residency</b> Cedars-Sinai Medical Center (Los Angeles) <b>Board Certifications</b> Interventional Cardiology <b>Experience</b> 20 years  <b>Personal Statement</b> I let my patients lead the way I counsel them. My patients will be able to increase their capacity to act on issues that they themselves define as important.
	<b>Medical School</b> Harvard Medical School <b>Residency</b> New York-Presbyterian Hospital <b>Board Certifications</b> Interventional Cardiology <b>Experience</b> 25 years  <b>Personal Statement</b> I believe in equality with my patients and support them to become equal partners with me in the management of their condition.
	<b>Medical School</b> Stanford Medical School <b>Residency</b> Mayo Clinic <b>Board Certifications</b> Minimally Invasive Surgery <b>Experience</b> 25 years  <b>Personal Statement</b> In my practice, I will make an effort to educate you about your condition, treatment and medication so that you are empowered to participate in your own medical health.



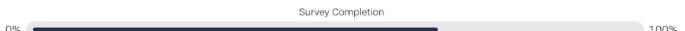


# Berkeley

UNIVERSITY OF CALIFORNIA

Based on the below information, who would you want your **Dentist** to rather be?

 <div style="border-top: none;"> <b>Dental School</b>            University of California San Francisco (UCSF) School of Dentistry  <b>Residency</b>            UCSF Medical Center, San Francisco  <b>Board Certifications</b>            General Dentistry  <b>Experience</b>            22 years         </div> <p><b>Personal Statement</b></p> <p>I am proactive with patients, talking to them about different aspects of their lives that affect their health.</p>	 <div style="border-top: none;"> <b>Dental School</b>            Harvard School of Dental Medicine  <b>Residency</b>            Stanford Hospital  <b>Board Certifications</b>            Oral and Maxillofacial Surgery  <b>Experience</b>            20 years         </div> <p><b>Personal Statement</b></p> <p>My philosophy is that "an ounce of prevention is better than a pound of cure."</p>	 <div style="border-top: none;"> <b>Dental School</b>            University of North Carolina Chapel Hill School of Dentistry  <b>Residency</b>            NewYork-Presbyterian Hospital  <b>Board Certifications</b>            General Dentistry  <b>Experience</b>            21 years         </div> <p><b>Personal Statement</b></p> <p>I treat my patients' current concerns and also educate them about good practices to prevent future issues too.</p>	 <div style="border-top: none;"> <b>Dental School</b>            The University of California Los Angeles School of Dentistry  <b>Residency</b>            Massachusetts General Hospital  <b>Board Certifications</b>            Oral and Maxillofacial Surgery  <b>Experience</b>            20 years         </div> <p><b>Personal Statement</b></p> <p>I constantly update my skills to counsel patients about lifestyle and behavior interventions.</p>
--	--	--	---



# Berkeley

UNIVERSITY OF CALIFORNIA

Based on the below information, who would you want your **Psychiatrist** to rather be?

 <div style="border-top: none;"> <b>Medical School</b>            Perleman School of Medicine at the University of Pennsylvania  <b>Residency</b>            NewYork-Presbyterian Hospital  <b>Board Certifications</b>            Addiction Psychiatry  <b>Experience</b>            25 years         </div> <p><b>Personal Statement</b></p> <p>I like to help my patients understand the important role they have in managing their own health challenges by taking time to understand their needs.</p>	 <div style="border-top: none;"> <b>Medical School</b>            Duke University of Medicine  <b>Residency</b>            University of California - San Francisco  <b>Board Certifications</b>            Clinical Neurophysiology  <b>Experience</b>            27 years         </div> <p><b>Personal Statement</b></p> <p>I believe that patients need to be involved in designing more effective treatment and I tailor my approach to my patients' needs.</p>	 <div style="border-top: none;"> <b>Medical School</b>            Johns Hopkins University  <b>Residency</b>            Stanford Health Care  <b>Board Certifications</b>            Psychiatry  <b>Experience</b>            21 years         </div> <p><b>Personal Statement</b></p> <p>Patients are the best stewards of their health so I empower my patients by taking extra care to communicate instructions for chronic and long-term health conditions.</p>	 <div style="border-top: none;"> <b>Medical School</b>            Harvard Medical School  <b>Residency</b>            Massachusetts General Hospital  <b>Board Certifications</b>            Psychiatry  <b>Experience</b>            29 years         </div> <p><b>Personal Statement</b></p> <p>Through active listening, I am able to provide compassionate, patient-centered care.</p>
---	---	--	---





# Berkeley

UNIVERSITY OF CALIFORNIA

Based on the below information, please assign a score to below **OBGYNs (Obstetrics and Gynecology)**?  
100 means you **absolutely like** that doctor to be your OBGYN. 0 means you **don't want** that doctor to be your OBGYN **at all**.

0      10      20      30      40      50      60      70      80      90      100

	Medical School UCSF School of Medicine Residency UCSF School of Medicine Board Certifications Obstetrics and Gynecology Experience 12 Years Personal Statement Collaborative decision could lead to the best treatment result.
---	---

---

	Medical School University of California, Los Angeles Residency Stanford University Board Certifications Obstetrics and Gynecology Experience 13 Years Personal Statement Communication is the most important thing. My goal is to make women feel comfortable with their bodies and health choices.
---	--

---

	Medical School Washington University School of Medicine Residency Pennsylvania Hospital, University of Pennsylvania Board Certifications Obstetrics and Gynecology Experience 13 Years Personal Statement To make women feel comfortable to share information and their health choices.
---	--

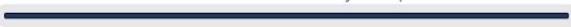
---

	Medical School UC Irvine School of Medicine Residency University of California San Francisco Board Certifications Obstetrics and Gynecology Experience 14 Years Personal Statement Be professional, focus on patient education and make sure the patient learns what they need to know and feel comfortable to the treatment.
---	--

---



## Survey Completion

0%  100%

# Berkeley

UNIVERSITY OF CALIFORNIA

Based on the below information, please assign a score to below **Urologists**?

100 means you **absolutely like** that doctor to be your urologist. 0 means you **don't want** that doctor to be your urologist **at all**.

0      10      20      30      40      50      60      70      80      90      100

	Medical School
	University of Michigan - Ann Arbor
	Residency
	Cleveland Clinic
	Board Certifications
American Board of Medical Specialties	
Experience	
26 Years	
Personal Statement	
I have a knack for problem solving. I have taken up multiple complex surgeries with success.	

	Medical School
	Northwestern University
	Residency
	John Hopkins Hospital
	Board Certifications
American Board of Urology	
Experience	
26 Years	
Personal Statement	
The voice of my patients speaks about my credibility. I am known to be a phenomol practitioner, caring and empathetic.	

	Medical School
	Columbia University
	Residency
	Mayo Clinic
	Board Certifications
American Board of Urology	
Experience	
25 Years	
Personal Statement	
I use the latest in treatment techniques and specialized medicine to fight for every individual's life.	

	Medical School
	University of Cincinnati - College of Medicine
	Residency
	UCLA Medical Center
	Board Certifications
American Board of Medical Specialties	
Experience	
27 Years	
Personal Statement	
I promise you that a visit will give you a very positive perspective about your issues. I like to draw treatment plans early and talk to patients in detail about them.	



## C. Results of Regressions with Various Covariates Interacting with Outcome Variable

### a. Interaction of gender and education

Call:

```
lm(formula = Y_4spec_female ~ gender + degree + gender * degree)
```

Residuals:

Min	1Q	Median	3Q	Max
-2.55556	-0.55556	-0.06731	0.88679	2.00000

Coefficients: (1 not defined because of singularities)

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	2.36585	0.16483	14.354	<2e-16	***
genderMale	-0.26585	0.25357	-1.048	0.295	
degreeBachelor's Degree (4-year)	-0.10270	0.20451	-0.502	0.616	
degreeDoctoral Degree	0.23415	0.37223	0.629	0.530	
degreeHigh School Graduate	0.18970	0.20649	0.919	0.359	
degreeLess than high school Degree	-0.43333	0.63908	-0.678	0.498	
degreeMaster's Degree	0.11034	0.28321	0.390	0.697	
degreePrefer NOT to disclose	0.05081	0.34640	0.147	0.883	
degreeProfessional Degree (MD, JD etc.)	-0.36585	0.31847	-1.149	0.251	
genderMale:degreeBachelor's Degree (4-year)	0.07000	0.29944	0.234	0.815	
genderMale:degreeDoctoral Degree	-0.23415	0.53579	-0.437	0.662	
genderMale:degreeHigh School Graduate	-0.17649	0.31746	-0.556	0.579	
genderMale:degreeLess than high school Degree	NA	NA	NA	NA	
genderMale:degreeMaster's Degree	-0.17034	0.40236	-0.423	0.672	
genderMale:degreePrefer NOT to disclose	0.13490	0.56235	0.240	0.811	
genderMale:degreeProfessional Degree (MD, JD etc.)	0.26585	0.48971	0.543	0.587	

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.055 on 475 degrees of freedom

Multiple R-squared: 0.03453, Adjusted R-squared: 0.006076

F-statistic: 1.214 on 14 and 475 DF, p-value: 0.2614

## b. Interaction of gender and income

Call:

```
lm(formula = Y_4spec_female ~ gender + income + gender * income)
```

Residuals:

Min	1Q	Median	3Q	Max
-2.41667	-0.41667	-0.08532	0.75000	1.92771

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	2.26087	0.12507	18.077	< 2e-16 ***
genderMale	-0.04465	0.21169	-0.211	0.833024
income\$100,000 to \$149,999	0.05620	0.20485	0.274	0.783928
income\$150,000 to \$199,999	0.07246	0.36819	0.197	0.844058
income\$200,000 or more	0.57246	0.27496	2.082	0.037875 *
income\$50,000 to \$99,999	-0.01087	0.17752	-0.061	0.951202
incomeLess than \$10,000	0.85024	0.27496	3.092	0.002103 **
incomePrefer NOT to disclose	0.15580	0.24619	0.633	0.527154
genderMale:income\$100,000 to \$149,999	-0.17406	0.29804	-0.584	0.559489
genderMale:income\$150,000 to \$199,999	-0.16368	0.54739	-0.299	0.765058
genderMale:income\$200,000 or more	-0.42026	0.40196	-1.046	0.296316
genderMale:income\$50,000 to \$99,999	-0.13306	0.27145	-0.490	0.624240
genderMale:incomeLess than \$10,000	-1.46646	0.42038	-3.488	0.000531 ***
genderMale:incomePrefer NOT to disclose	-0.52201	0.37914	-1.377	0.169207

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.039 on 476 degrees of freedom

Multiple R-squared: 0.06254, Adjusted R-squared: 0.03694

F-statistic: 2.443 on 13 and 476 DF, p-value: 0.003266

### c. Interaction of gender and race

Call:

```
lm(formula = Y_4spec_female ~ gender + race + gender * race)
```

Residuals:

Min	1Q	Median	3Q	Max
-2.48387	-0.48387	-0.02521	0.81429	2.15789

Coefficients: (1 not defined because of singularities)

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	2.45866	0.48732	5.045	6.46e-07	***
genderMale	-0.45866	0.12814	-3.579	0.00038	***
raceAsian / Pacific Islander	-0.08366	0.51489	-0.162	0.87099	
raceBlack or African American	-0.24127	0.53435	-0.452	0.65182	
raceHispanic	-0.39984	0.55000	-0.727	0.46759	
raceMultiple ethnicities	-0.20866	0.71680	-0.291	0.77110	
raceOthers not mentioned	0.04134	0.88889	0.047	0.96293	
racePrefer NOT to disclose	-0.79199	0.64938	-1.220	0.22322	
raceWhite / Caucasian	0.02521	0.47994	0.053	0.95813	
genderMale:raceAsian / Pacific Islander	0.26938	0.24462	1.101	0.27138	
genderMale:raceBlack or African American	0.08337	0.35021	0.238	0.81193	
genderMale:raceHispanic	0.59984	0.43814	1.369	0.17163	
genderMale:raceMultiple ethnicities	0.70866	0.69062	1.026	0.30536	
genderMale:raceOthers not mentioned	-0.24134	0.88889	-0.272	0.78612	
genderMale:racePrefer NOT to disclose	1.01422	0.56872	1.783	0.07517	.
genderMale:raceWhite / Caucasian	NA	NA	NA	NA	

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.051 on 475 degrees of freedom

Multiple R-squared: 0.04196, Adjusted R-squared: 0.01373

F-statistic: 1.486 on 14 and 475 DF, p-value: 0.1118

#### d. Interaction of gender and age

```
Call:  
lm(formula = Y_4spec_female ~ gender + age + gender * age)  
  
Residuals:  
    Min      1Q  Median      3Q     Max  
-2.54755 -0.51492 -0.05418  0.89681  1.96698  
  
Coefficients:  
            Estimate Std. Error t value Pr(>|t|)  
(Intercept)  2.692585  0.202259 13.313 <2e-16 ***  
genderMale   -0.687771  0.283502 -2.426  0.0156 *  
age          -0.007252  0.004557 -1.591  0.1122  
genderMale:age  0.008662  0.006437  1.346  0.1790  
---  
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1  
  
Residual standard error: 1.046 on 482 degrees of freedom  
(4 observations deleted due to missingness)  
Multiple R-squared:  0.02903, Adjusted R-squared:  0.02298  
F-statistic: 4.803 on 3 and 482 DF, p-value: 0.00263
```