Non-English Speakers Attend Gastroenterology Clinic Appointments at Higher Rates Than English Speakers in a Vulnerable Patient Population

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Goals: We sought to identify factors associated with gastroenterology clinic attendance in an urban safety net healthcare system.

Background: Missed clinic appointments reduce the efficiency and availability of healthcare, but subspecialty clinic attendance among patients with established healthcare access has not been studied.

Study: We performed an observational study using secondary data from administrative sources to study patients referred to, and scheduled for an appointment in, the adult gastroenterology clinic serving the safety net healthcare system of San Francisco, CA. Our dependent variable was whether subjects attended or missed a scheduled appointment. Analysis included multivariable logistic regression and classification tree analysis. A total of 1833 patients were referred and scheduled for an appointment between May 2005 and August 2006. Prisoners were excluded. All patients had a primary care provider.

Results: Six hundred eighty-three patients (37.3%) missed their appointment; 1150 patients (62.7%) attended. Language was highly associated with attendance in the logistic regression; non-English speakers were less likely than English speakers to miss an appointment [adjusted odds ratio 0.42 (0.28, 0.63) for Spanish, 0.56 (0.38, 0.82) for Asian language, $P < 0.001$]. Other factors were also associated with attendance, but classification tree analysis identified language to be the most highly associated variable.

Conclusions: In an urban safety net healthcare population, among patients with established healthcare access and a scheduled gastroenterology clinic appointment, not speaking English was most strongly associated with higher attendance rates. Patient-related factors associated with not speaking English likely influence subspecialty clinic attendance rates, and these factors may differ from those affecting general healthcare access.

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When patients miss outpatient clinic appointments, the efficiency of healthcare is reduced and patients experience longer wait times for appointments.[1] Longer waiting times may reduce healthcare quality; in geriatric populations, longer waiting times have been associated with increased mortality rates.[2] Missed clinic appointments place economic strain on the healthcare system,[3] and patients who routinely miss clinic appointments experience poorer health outcomes.[4] Despite the increasing importance of subspecialty care, missed clinic appointments among subspecialty clinics have been scarcely studied.[5,6]

Gastroenterology is an important specialty in which to examine clinic attendance because of its limited availability among many patient populations, including uninsured Californians, where availability continues to worsen.[7] Even in the general US population, demand for endoscopic colorectal cancer screening exceeds supply.[8] Missed outpatient appointments may further limit patient access to gastroenterology care. Reducing missed appointments could increase efficiency and availability of gastroenterology care, and possibly improve patient outcomes. Only one study of clinic attendance has been performed in a gastroenterology clinic, and this was small and survey-based.[9]

Because factors contributing to missed gastroenterology clinic appointments likely vary among different populations, groups at high risk of adverse health outcomes, such as patients served by safety net healthcare systems, should be studied. Many safety net healthcare systems experience significant shortages in subspecialty care.[10] Patients within the healthcare safety net experience reduced healthcare access,[11,12] which is thought to be a major contributor to healthcare inequities repeatedly demonstrated among non-English speakers and nonwhite patients.[13–23] Because most studies examine access to healthcare, it is not known how these variables affect appointment attendance among patients with established healthcare access. A better understanding of these patient-related variables could provide a basis for public health interventions to increase gastroenterology clinic attendance rates, which could increase efficiency and availability of gastroenterologic care among vulnerable populations. Findings might also be applicable to other subspecialty clinic types.

We sought to evaluate factors associated with missed gastroenterology clinic appointments within the vulnerable patient population served by the safety net healthcare system of San Francisco with a primary focus on language and race/ethnicity. On the basis of existing literature on healthcare access, we hypothesized that non-English speakers and nonwhite subjects would be less likely to attend scheduled gastroenterology clinic appointments than English speakers and white subjects.

MATERIALS AND METHODS

Study Design

We performed an observational study using secondary data from administrative sources. We studied patients referred to, and scheduled for an appointment in, the adult gastroenterology clinic serving the safety net healthcare system of San Francisco, CA. Our dependent variable was whether subjects attended or missed a scheduled appointment in the gastroenterology clinic. We considered subjects who were not seen by a physician in the gastroenterology clinic at any time after the date of referral to have missed their appointment. We defined subjects who were seen by a physician in the gastroenterology clinic after the date of referral to have attended their clinic appointment. Subjects who did not present for the initial scheduled clinic appointment had the option of rescheduling. Subjects who attended a rescheduled appointment were included in the "attended an appointment" group. We permitted subjects at least 7 additional weeks to reschedule.

Study Population

San Francisco General Hospital (SFGH) provides subspecialty care for the safety net healthcare system of the City and County of San Francisco, which includes multiple primary care clinics run by the San Francisco Department of Public Health, and affiliated independent Federally Qualified Health Centers and Federally-Funded 300(h) Grantee Centers. Patients are ethnically diverse (20% African American, 20% Asian/Pacific Islander, 25% white, and 30% Hispanic), and many are immigrants. Patients speak more than 20 different languages. Approximately 36% of outpatients at SFGH lack insurance, 34% have MediCal (California's Medicaid program), 16% have Medicare, and 14% report commercial payers or other sources.[24]

We studied all patients referred to, and scheduled for an appointment in, the adult gastroenterology clinic at SFGH between May 25, 2005 and August 22, 2006. Patients were excluded if they were prisoners at the time of referral because of ethical issues associated with studying prisoners. When a patient was referred more than once, we included only the initial referral.

Patient Referral and Clinic Scheduling

Patients were referred via an Internet-based, electronic referral program (eReferral) to the gastroenterology clinic by their primary care provider or, less commonly, at discharge from the hospital by inpatient physicians. All patients had a primary care provider. Referring providers entered patient-related data, including reason for consultation, history of present illness, past medical history, and medical workup. An experienced gastroenterologist (H.F.Y.) reviewed all referrals and scheduled clinic visits for appropriately referred patients. Primary care providers for scheduled patients received an e-mail with appointment information to permit patients to be notified of the appointment. Patients also received an automatically generated English-language appointment notification letter at the time of scheduling and a reminder letter 2 weeks before the scheduled appointment, or, in the case of patients whose appointments were within 2 weeks of the time of scheduling, a telephone call and an appointment letter. Patients and providers were able to call and reschedule appointments if patients missed the initial scheduled appointment. Scheduling staff spoke English, Spanish, and Chinese dialects (Cantonese and Mandarin).

Data Studied and Data Sources

We obtained data from 3 sources: the eReferral system database, the electronic medical record at SFGH, and the clinic-scheduling database. We linked all subject data using unique identification numbers, and compiled data electronically into a single database. We removed identifying information and assigned each subject a random, unique number. No subjects were contacted for the purposes of this study.

The dependent variable was whether a patient attended their clinic appointment. Independent variables included covariates with potential significance based upon the findings of other studies of healthcare access and utilization.[21,22,25–33] Demographic data included age, sex, self-reported primary language, self-reported race/ethnicity, several measures of socioeconomic status, history of substance abuse or psychiatric diagnoses, distance from subjects' home to the clinic, and insurance status. We used self-report to define race/ethnicity, as this has been used as the gold standard in previous research and is the recommended standard.[34–36] Responses were closed-ended, including Asian, black, Hispanic, Native American/Eskimo, white, and other. Primary language was self-reported and open-ended. Major categories were as follows: English, Spanish, Asian language, and other. We grouped together Cantonese, Korean, Laotian, Mandarin, Thai, or Vietnamese speakers as "Asian language" as there were few patients speaking each of these languages. We calculated distance from subjects' residence to the clinic using an Internet mapping program from subjects' zip code to the clinic. We include histories of substance abuse and psychiatric disease as independent variables, because these have been associated with reduced healthcare access in other studies. Subjects were considered to have a psychiatric disease or substance abuse if a relevant ICD-9 code had been entered into their medical record during the 6 months before referral. We obtained data regarding primary clinic type and referring provider level of training from the eReferral system. The number of days between referral and appointment date and whether the patient was seen in clinic were obtained from the clinic-scheduling database. Although reasons for patient referral were available, there was not a feasible method for categorizing reasons for referral or severity of patient complaints.

Data Analysis

We compared patients who attended or missed their clinic appointment using bivariate and multivariable statistical methods. For bivariate analyses, categorical variables were compared using χ^2 tests, and continuous variables were analyzed using 2-tailed t tests and analysis of

variance. We performed logistic regression for multivariable analysis, using dummy variables when necessary. Bivariate analyses and logistic regression analysis used Stata, version 9.2 (Statacorp, College Station, TX) and SAS, version 9.1 (SAS Institute, Cary, NC).

To identify the patients at highest risk of missing appointments, we employed classification tree analysis, which is a method used to better identify subgroups that are statistically alike with respect to covariates and outcome.[37] Such subgroup elicitation is not readily obtained through the use of conventional regression procedures.[38]

The outcome was not attending a clinic appointment, and all covariates employed for the logistic regression were evaluated. Because there were proportionately fewer patients who did not attend an appointment, equal prior proportions for the 2 outcome categories were specified, which upweighted the relative effect of misclassifying nonattendees.[37] At each step, the algorithm evaluated all potential "splits," or divisions into subgroups. Potential splits were evaluated both within and between individual covariates. A large tree was constructed and then pruned back using cross validation. Cross validation proceeded as follows: (1) data were randomly partitioned into 10 subsets, (2) 1 subset was withheld, and the model was fitted on the remaining 9 subsets, (3) the model was applied to the withheld subset, and (4) this was repeated with each of the 10 subsets serving as the withheld subset. This established what sized tree produced the fewest misclassification errors. Fitting of the classification tree models was via the rpart function of the R (2007) statistical language (R Development Core Team, Vienna Austria).

This study was approved by the University of California San Francisco Committee on Human Research, the General Clinical Research Center at SFGH, and the San Francisco Department of Public Health Privacy Board.

RESULTS

Study Population

One thousand eight hundred forty-nine patients were referred to the gastroenterology clinic and scheduled for an appointment during the study period. We excluded 16 subjects because they were prisoners, so 1833 subjects comprise our study population.

Six hundred eighty-three subjects (37.3%) never attended a clinic appointment. The remaining 1150 subjects (62.7%) did attend a clinic appointment. Of these, 187 were subjects who missed their initial appointment but presented for a subsequent appointment. Subjects missing the initial appointment but presenting later were similar to subjects presenting for the initial appointment.

Bivariate Analysis

There were significant bivariate differences between patients who missed and attended their appointment (Table 1).

Role of Language

Table 2 compares subjects based on language. English speakers were more likely to be male (56.6%), homeless (8.4%), and unemployed (63.9%) and to have histories of substance abuse (10.5%) or psychiatric disorders (21.8%) compared with other groups ($P < 0.001$ for all comparisons). English speakers were less likely to attend a clinic appointment (55.4% attended) compared with non-English speakers (73.3% attended, $P < 0.001$).

Role of Race/Ethnicity

Table 3 compares subjects based on self-reported race/ethnicity. Subjects of Asian descent had the highest attendance rates, and black subjects had the lowest attendance rates (72.2% vs. 49.4%, $P < 0.001$). Asian and Hispanic subjects were more likely than whites or blacks to be employed (54.7% of Asians and 53.0% of Hispanics vs. 21.4% of blacks and 43.1% of whites, $P < 0.001$) and to have any source of income (66.2% of Asians and 66.2% of Hispanics vs. 45.1% of blacks and 58.5% of whites, $P < 0.001$). Asian and Hispanic subjects were less likely to speak English than blacks or whites (27.6% of Asians and 34.0% of Hispanics vs. 96.3% of blacks and 89.4% of whites, $P < 0.001$).

Multivariable Logistic Regression

In the logistic regression, language and race/ethnicity were associated with appointment attendance, but language was more strongly associated (Table 4). Subjects speaking Spanish [adjusted odds ratio (AOR) 0.42, 95% confidence interval (CI) 0.28, 0.63] or an Asian language (AOR 0.56, 95% CI 0.38, 0.82) were less likely than English-speaking subjects to miss their appointment. Black (AOR 1.55, 95% CI 1.15, 2.08) and Hispanic (AOR 1.53, 95% CI 1.06, 2.22) subjects were more likely than white subjects to miss their appointment. Other factors that were significantly associated with missed appointments included the absence of any source of income, higher number of days between referral and scheduled appointment, and primary clinic type other than Family Practice.

English speakers were more likely to be male and younger compared with non-English speakers, but neither of these variables remained significant in the logistic regression. Language, however, remained strongly associated with attendance rates when analysis was controlled for sex and age as potential confounders. English speakers were also more likely to have multiple indicators of low socioeconomic status, including homelessness, unemployment, substance abuse, psychiatric disease, and lack of income. All these variables were evaluated, but only lack of income was significant in the controlled multivariable analysis. We created a composite socioeconomic status variable that integrated these 5 variables. When the composite variable was added to the logistic regression depicted in Table 4, it was not statistically significant and did not improve the fit of the model. When lack of an income source was removed from the model, the composite socioeconomic status variable gained significance, but the model fit did not improve compared with the original model. Lack of income is therefore the socioeconomic variable most highly associated with clinic attendance, and was the only socioeconomic variable retained in the final regression model.

Classification Analysis

The top node in the classification tree (Fig. 1) includes all subjects in the study. The first split was made on the basis of primary language, identifying language as the variable most highly associated with appointment

TABLE 1. Population Characteristics

Characteristics	Total Population (n = 1833)	Patients Who did not Attend an Appointment (n = 683, 37.3%)	Patients Who did Attend an Appointment (n = 1150, 62.7%)	P*
Age, mean (SD), y	53.0 (12.6)	52.1 (12.9)	53.6 (12.4)	0.02
Women, no. (%)	957 (52.2)	336 (49.2)	621 (54.0)	0.05
Race/ethnicity, no. (%)				
White	424 (23.1)	166 (24.3)	258 (22.4)	
Black	348 (19.0)	176 (25.8)	172 (15.0)	
Asian	550 (30.0)	153 (22.4)	397 (34.5)	
Hispanic	453 (24.7)	160 (23.4)	293 (25.5)	
Other	35 (1.9)	15 (2.2)	20 (1.7)	< 0.001†
Primary language, no. (%)				
English	1,053 (57.4)	469 (68.7)	583 (50.7)	
Asian language	381 (20.8)	93 (13.6)	288 (25.0)	
Spanish	296 (16.1)	84 (12.3)	212 (18.4)	
Other	73 (4.0)	23 (3.4)	50 (4.4)	< 0.001†
Socioeconomic status measures				
Homeless, no. (%)	101 (5.5)	56 (8.2)	45 (3.9)	< 0.001†
Telephone access, no. (%)	1,819 (99.2)	676 (99.0)	1,143 (99.4)	0.32
Any insurance, no. (%)	976 (53.4)	366 (54.0)	610 (53.0)	0.70
Type of insurance, no. (%)				
Public	961 (52.4)	357 (52.3)	604 (52.5)	
Private	15 (0.8)	9 (1.3)	6 (0.5)	
Uninsured	852 (46.5)	312 (45.7)	540 (47.0)	0.008
Monthly income, mean (SD), $	790 (702)	717 (648)	833 (729)	< 0.001†
Employed, no. (%)	810 (45.1)	246 (37.3)	564 (49.7)	< 0.001†
Any income source, no. (%)	1,078 (60.0)	349 (52.9)	729 (64.2)	< 0.001†
Distance from home to clinic, mean (SD), miles	4.3 (3.9)	4.0 (3.5)	4.4 (4.1)	0.05
Substance abuse, no. (%)	125 (6.8)	64 (9.4)	61 (5.3)	0.001†
Psychiatric diagnosis, no. (%)	313 (17.1)	130 (19.0)	183 (15.9)	0.09
Primary clinic, no. (%)				
Internal medicine	743 (40.6)	326 (47.7)	417 (36.3)	
Family practice	1,037 (56.6)	333 (48.9)	704 (61.3)	
Other	52 (2.8)	24 (3.5)	28 (2.4)	< 0.001†
Type of referring provider, no. (%)				
Attending physician	1,139 (62.1)	422 (61.8)	717 (62.4)	
Trainee physician	406 (22.1)	164 (24.0)	242 (21.0)	
Midlevel provider	286 (15.6)	97 (14.2)	189 (16.4)	0.23
Time from referral to scheduled appointment date, mean (SD), days	114.6 (59.8)	119.0 (59.1)	112.1 (60.1)	0.02
Days from referral to actual clinic visit, mean (SD), days	—	—	122.1 (71.3)	—

*P Values cited compare attendees with nonattendees; total population data are listed for reference only.
†$P < 0.0016$, the level of statistical significance using the Bonferroni correction.

attendance: 73.9% of Spanish and Asian language speakers attended versus 56.2% of other subjects. Among Spanish and Asian language speakers, no further splits were made. Among speakers of English or "other" languages, a scheduled appointment in 120.5 days or less was predictive of attendance. Further subgroups are interpreted in a similar fashion. Only the initial split on language withstood cross-validation; other splits were not reliably reproducible from a classification perspective, reinforcing the strength of the association between language and attendance rates in this patient population.

DISCUSSION

Among patients served by the safety net healthcare system of San Francisco, patients speaking languages other than English attended scheduled gastroenterology clinic appointments at higher rates than English speakers. Although other variables contributed to attendance rates, language was the variable most highly associated with attendance.

We chose a priori to focus on the role of language and race/ethnicity for several reasons. These patient-related variables are of sufficient significance to merit inclusion as a prominent component of Healthy People 2010,[39] because non-English speakers and nonwhite patients have been repeatedly found to experience significant barriers to healthcare resulting in reduced healthcare access. Because all the patients in our population have healthcare access, we wanted to determine whether barriers to clinic attendance also existed on the basic of language and race/ethnicity. Multiple inputs, including measures of socioeconomic status, language, transportation, insurance status, and psychiatric comorbidities likely contribute to clinic attendance, and we included many of these in our analyses. We did not intend to identify a causal role for language or race/

TABLE 2. Characteristics of Subject According to Primary Language Spoken

Characteristics	English (n = 1053)	Asian Language (n = 381)	Spanish (n = 296)	Other (n = 73)	All Non-English Speakers (n = 750)‡	*P*
Age, mean (SD), y	51.7 (12.1)	57.1 (10.1)	52.2 (15.2)	54.5 (13.6)	54.8 (13.0)	< 0.001*
Women, no. (%)	456 (43.4)	246 (64.6)	197 (66.6)	39 (53.4)	482 (64.3)	< 0.001†
Homeless, no. (%)	88 (8.4)	2 (0.5)	8 (2.7)	1 (1.4)	11 (1.5%)	< 0.001†
Telephone access, no. (%)	1,044 (99.2)	378 (99.2)	294 (99.3)	73 (100.0)	745 (99.3)	0.55†
Any insurance, no. (%)	543 (51.7)	242 (63.7)	126 (42.7)	49 (68.1)	417 (55.8)	< 0.001†
Monthly income, mean (SD), $	734 (648)	954 (716)	771 (798)	866 (866)	864 (763)	< 0.001*
Employed, no. (%)	371 (36.1)	216 (57.1)	167 (57.2)	43 (60.6)	426 (57.5)	< 0.001†
Any income source, no. (%)	567 (55.2)	247 (65.3)	198 (67.8)	48 (67.6)	493 (66.5)	< 0.001†
Distance from home to clinic, mean (SD), miles	4.1 (3.9)	5.3 (3.4)	2.9 (2.9)	6.5 (6.6)	4.5 (3.8)	< 0.001*
Substance abuse, no. (%)	110 (10.5)	0 (0.0)	11 (3.7)	3 (4.1)	14 (1.9)	< 0.001†
Psychiatric diagnosis, no. (%)	229 (21.8)	35 (9.2)	34 (11.5)	11 (15.1)	80 (10.7)	< 0.001†
Primary clinic, No. (%)						
Internal medicine	509 (48.4)	92 (24.2)	111 (37.5)	16 (21.9)	219 (29.2)	
Family practice	518 (49.2)	273 (71.8)	176 (59.5)	57 (78.1)	506 (67.6)	
Other	25 (2.4)	15 (4.0)	9 (3.0)	0 (0.0)	24 (3.2)	< 0.001†
Did not attend an appointment, no. (%)	469 (44.6)	93 (24.4)	84 (28.4)	23 (31.5)	200 (26.7)	< 0.001†

*P value calculated by analysis of variance.
†P value calculated by χ^2.
‡Non-English speaker category not included in statistical analysis, is present for reference only.

ethnicity in determining clinic attendance rates, but sought to determine whether these were associated with clinic attendance. The identification of groups at higher risk of nonattendance may facilitate development of interventions to improve attendance, which could increase clinic efficiency and improve patient outcomes.

We found other studies of race/ethnicity and language to be of limited applicability to safety net populations, as most have not been performed among these specific populations. In other studies, there are significant differences in income and other measures of socioeconomic status between English and non-English speakers and between whites and nonwhites.[14–16,18,19] The magnitude of such differences in our population was small (eg, mean monthly income was $734 for English speakers vs. $864 for non-English speakers, and $761 for whites vs. $801 for

TABLE 3. Characteristics of Subjects According to Race/Ethnicity

Characteristics	White (n = 424)	Black (n = 348)	Asian (n = 550)	Hispanic (n = 453)	Other (n = 35)	Total Non-White (n = 1386)‡	*P*
Age, mean (SD), y	50.7 (10.9)	52.8 (11.1)	56.7 (11.5)	51.4 (14.9)	49.6 (13.9)	53.8 (12.9)	< 0.001*
Women, no. (%)	158 (37.3)	152 (43.7)	339 (61.6)	275 (60.7)	20 (57.1)	786 (56.7)	< 0.001†
English-speaking, no. (%)	379 (89.4)	335 (96.3)	152 (27.6)	154 (34.0)	21 (60.0)	662 (47.8)	< 0.001†
Homeless, no. (%)	38 (9.0)	40 (11.5)	3 (0.6)	15 (3.3)	2 (5.7)	60 (4.3)	< 0.001†
Telephone access, no. (%)	421 (99.3)	346 (99.4)	545 (99.1)	449 (99.1)	35 (100)	1,375 (99.2)	0.97†
Any insurance, no. (%)	215 (50.7)	198 (56.9)	337 (61.3)	205 (45.3)	16 (45.7)	756 (54.6)	< 0.001†
Monthly income, mean (SD), $	761 (675)	652 (525)	938 (746)	766 (768)	580 (511)	801 (709)	< 0.001*
Employed, no. (%)	180 (43.1)	72 (21.4)	298 (54.7)	238 (53.0)	16 (47.1)	624 (45.7)	< 0.001†
Any income source, no. (%)	244 (58.5)	152 (45.1)	361 (66.2)	297 (66.2)	17 (50.0)	827 (60.6)	< 0.001†
Distance from home to clinic, mean (SD), miles	4.5 (4.8)	4.0 (3.6)	5.1 (3.6)	3.1 (3.3)	4.4 (2.4)	4.2 (3.6)	< 0.001*
Substance abuse, no. (%)	52 (12.3)	47 (13.5)	3 (0.6)	21 (4.6)	1 (2.9)	72 (5.2)	< 0.001†
Psychiatric diagnosis, no. (%)	98 (23.1)	76 (21.8)	61 (11.1)	70 (15.5)	3 (8.6)	210 (15.2)	< 0.001†
Primary clinic, no. (%)							
Internal medicine	220 (51.9)	168 (48.3)	153 (27.9)	176 (38.9)	16 (45.7)	513 (37.0)	
Family practice	196 (46.2)	176 (50.6)	377 (68.7)	261 (57.6)	16 (45.7)	830 (59.9)	
Other	8 (1.9)	4 (1.2)	19 (3.5)	16 (3.5)	3 (8.6)	42 (3.0)	< 0.001†
Did not attend an appointment, no. (%)	166 (39.2)	176 (50.6)	153 (27.8)	160 (35.3)	15 (42.9)	504 (36.4)	< 0.001†

*P value calculated by analysis of variance.
†P value calculated by χ^2.
‡Nonwhite speaker category not included in statistical analysis, is present for reference only.

TABLE 4. Logistic Regression of Factors Associated With Missing Clinic Appointment

Independent Variables	Unadjusted Odds Ratio (95% Confidence Interval)	Adjusted Odds Ratio (95% Confidence Interval)	*P*†
Language*			< 0.001
English	1 (reference)	1 (reference)	
Spanish	0.49 (0.37, 0.65)	0.42 (0.28, 0.63)	
Asian language	0.40 (0.31, 0.52)	0.56 (0.38, 0.82)	
Race/ethnicity*			0.01
White	1 (reference)	1 (reference)	
Black	1.59 (1.19, 2.12)	1.55 (1.15, 2.08)	
Hispanic	0.85 (0.65, 1.12)	1.53 (1.06, 2.22)	
Asian	0.60 (0.46, 0.78)	0.95 (0.66, 1.38)	
No source of income	1.60 (1.31, 1.94)	1.42 (1.16, 1.74)	< 0.001
Primary clinic*			< 0.001
Internal medicine	1 (reference)	1 (reference)	
Family practice	0.61 (0.50, 0.74)	0.70 (0.57, 0.87)	
Other	1.10 (0.62, 1.93)	1.45 (0.80, 2.63)	
Time from referral to scheduled appointment date, days	1.002 (1.000, 1.003)	1.003 (1.001, 1.004)	< 0.001

*P value represents significance of entire set of responses.
†P value refers to the adjusted odds ratio.

nonwhites), and we adjusted for these in the multivariable analyses.

Our results differ from most prior studies of language, which document lower rates of healthcare access and utilization among non-English speakers compared with English speakers.[18–22] Differences in our study population compared with other studies of healthcare access and utilization may partially explain our findings, because our study was undertaken within a safety net healthcare setting. Our findings may reflect differences in the selective forces that lead English speakers and non-English speakers to seek care in a safety net healthcare system. Non-English speakers are more likely than English speakers to be first-generation immigrants.[40] An individual who successfully immigrates to the United States may have beliefs, practices, and social networks that helped them navigate the complex immigration system and a new country of residence (the ''healthy immigrant effect''),[41] and those factors may facilitate attendance at clinic appointments. Such social networks might also provide practical assistance with appointment-related tasks such as reminding patients of appointments and providing transportation and child-care or elder-care. Conversely, English speakers in our study had significantly higher rates of homelessness, joblessness, substance abuse, and mental illness. None of these variables remained significant in the multivariable analyses (either independently or when constructed as a composite socio-economic status variable), but taken together, they may represent higher levels of marginalization among English speakers compared with non-English speakers, which may contribute to lower clinic attendance rates.

Differences in our research question compared with prior studies may also explain our distinct findings. Most studies evaluate differences in *access* to healthcare among different patient groups. As a recent example for comparison, Ananthakrishnan et al[17] studied colorectal cancer screening in Medicare beneficiaries, comparing rates of screening in white versus nonwhite patients. To receive screening, patients had to have a provider who offered screening, patients had to schedule an appointment, and they had to attend the appointment and receive screening; it was not possible to separate patient, provider, and systems-related factors that affected utilization of colorectal cancer screening. Our study, alternatively, looked at the more specific question of what patient factors were associated with attendance at scheduled gastroenterology clinic appointments among patients with established healthcare access and a scheduled clinic appointment. The presence of a primary care provider and an established appointment in the gastroenterology clinic minimized access barriers and systems-related factors that have been the focus of other studies. Referrals were reviewed and judged to be appropriate by both a primary care provider and a gastroenterologist. This minimized inappropriate referrals and provider-related factors that may affect other studies. Our more focused analysis may therefore have revealed patient-related factors affecting subspecialty clinic attendance that were previously obscured by systems and provider-related factors relating to healthcare *access*, and this may explain the uniqueness of our findings.

SFGH has employed multiple efforts to improve healthcare access among non-English speakers and has won several awards for their interpreter services. Many employees, including front desk staff, nurses, and physicians, speak Spanish, Chinese dialects, and other non-English languages. Educational materials and forms are available in multiple languages. SFGH has one of the most comprehensive interpreter services in the nation, including a large trained interpreter staff, video medical interpreters, and phone interpreter services. Many clinics are located in neighborhoods where non-English speakers live, and these often employ persons from similar racial/ethnic groups to the populations that use them. All of these efforts may increase the attractiveness of the SFGH system to non-English speakers, and this may partially account for their higher attendance rates.

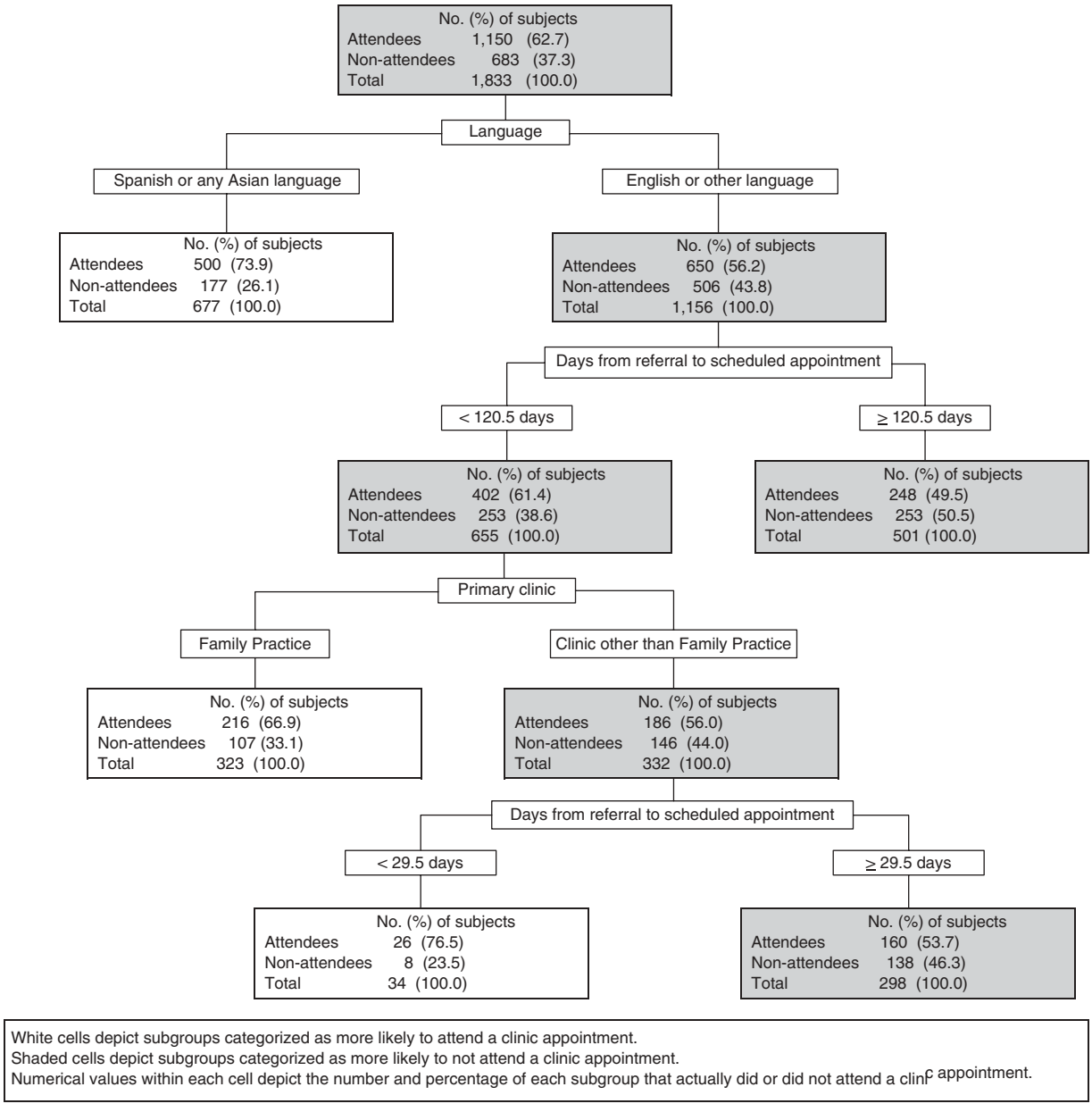

FIGURE 1. Classification tree analysis evaluating subjects' likelihood of attending or not attending an appointment.

Because the patient population in which we performed our study is highly selected, our results are not universally generalizable, but may be generalizable to other safety net systems in diverse urban communities. We evaluated only a single clinic type, but our findings may be applicable to other subspecialty clinic types, especially those within safety net healthcare populations. Because all referrals were evaluated by a single gastroenterologist (H.F.Y.), selection bias may affect our results, but it is unclear how this would occur on the basis of language. All patients were sent notification of their appointment date and time by telephone and/or mailed postcards, but we were unable to determine which patients actually received notification, and there was no mechanism to determine reasons for missed appointments. We were unable to systematically evaluate reasons for, or urgency of, patient referral, owing to lack of a standardized categorization scheme. Patients with urgent or symptomatic reasons for referral might be more likely to attend appointments, but it is not clear how this would relate to language.

Subspecialty care may improve outcomes for specific diseases when compared with generalist care and may lower mortality rates among patients receiving both subspecialty and general care compared with either alone.[42,43] Gastroenterology is a limited subspecialty resource throughout the United States, and with supply expected to further decrease among vulnerable patient populations,[7] it is vital that attendance at scheduled appointments be optimized in these

patient groups. Even when applied to other, more privileged populations, our study underscores the importance of evaluating which patients attend clinic appointments and which patients fail to attend, so that the efficiency and quality of subspecialty healthcare provided may be increased.

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