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Perceived Social Standing, Medication Nonadherence, and Systolic Blood Pressure in the Rural South

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Abstract

Purpose—Little is known about how perceived social standing versus traditional socioeconomic characteristics influence medication adherence and blood pressure (BP) among African American and white patients with hypertension in the rural southeastern United States.

Methods—Perceived social standing, socioeconomic characteristics, self-reported antihypertensive medication adherence, and BP were measured at baseline in a cohort of rural African American and white patients (n = 495) with uncontrolled hypertension attending primary care practices. Multivariate models examined the relationship of perceived social standing and socioeconomic indicators with medication adherence and systolic BP.

Findings—Medication nonadherence was reported by 40% of patients. Younger age [$\beta = 0.20$; $P = .001$], African American race [$\beta = -0.30$; $P = .03$], and lower perceived social standing [$\beta = 0.08$; $P = .002$] but not sex or traditional socioeconomic characteristics including education and house-hold income, were significantly associated with lower medication adherence. Race-specific analyses revealed that this pattern was limited to African Americans and not observed in whites. In stepwise modeling, older age [$\beta = 0.57$, $P = .001$], African American race [$\beta = 4.4$; $P = .03$], and

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lower medication adherence [$\beta = -1.7$, $P = .01$] but not gender, education, or household income, were significantly associated with higher systolic BP.

Conclusions—Lower perceived social standing and age, but not traditional socioeconomic characteristics, were significantly associated with lower medication adherence in African Americans. Lower medication adherence was associated with higher systolic BP. These findings suggest the need for tailored, culturally relevant medication adherence interventions in rural communities.

Keywords

health disparities; health services research; hypertension; medication adherence; social determinants of health

Medication nonadherence and its relationship to uncontrolled hypertension is a complex problem that has been the subject of considerable investigation.[1-5] Inadequate medication adherence is highly prevalent in hypertensive individuals and is associated with adverse cardiovascular (CV) outcomes, which may occur at an earlier age in minority patients.[6,7] Published data identify a variety of patient and health system factors associated with medication adherence and have led to important advances in the development of interventions designed to improve medication adherence.[8-10] However, most of the available adherence data, which are often collected from insured populations in large metropolitan areas and/or from large health systems,[1] may have limited applicability for uninsured or rural patients. Furthermore, there are limited data on medication adherence in rural patients, and these data are often from a single setting such as a university-linked academic practice.[11]

Although most studies examine traditional demographic (eg, age, race, gender) and objective socioeconomic (eg, income, education level) characteristics in health research, rural patients' perception of their own social standing—how they perceive themselves in the social hierarchy of the community—may have a stronger influence on health behaviors than objective socioeconomic indicators.[12] In rating perceived social standing, individuals consider more than just their relative standing on objective socioeconomic measures (eg, income, education level); they also consider past circumstances and experiences (eg, educational quality), family history and resources (eg, wealth of extended family), future prospects and opportunities, as well as psychological factors (eg, self-esteem, respect from peers) that affect health trajectories. Therefore, perceived social standing is more than simply how many resources one has; rather, it is also how much one believes one has relative to others.[12] There may be a poor correlation between perceived social standing and objective socioeconomic measures, and this may vary by race. Perceived social standing may be influenced by a variety of current or past experiences, may be affected by distress or depression, and may influence self-care behaviors, including medication adherence, regardless of traditional demographic or socioeconomic characteristics. The relationship of perceived social standing to selected psychosocial and metabolic risk factors associated with CV disease among African Americans has been previously explored in the Jackson Heart Study, but that study did not include medication-taking behavior.[13]

Little is known about the relationship of perceived social standing versus traditional socioeconomic characteristics and inadequate medication adherence in impoverished rural communities with large minority populations in the “stroke belt”—a geographic area in the southeastern United States originally designated by NHLBI in which local stroke mortality rates exceeded national rates by at least 10%. Such communities may have a variety of care delivery systems (private practice, hospital-owned practice, federally funded community health center) and a variety of pharmacies/programs (chain, independent, 340b drug discount program) that may impact medication use. Finally, many adherence interventions have been broadly applied, often with limited consideration of the factors that underlie inadequate adherence, and often without tailoring or consideration of targeting interventions to the unique needs of high-risk subgroups such as rural-dwelling individuals.[10] A more careful understanding of patient perception of social standing versus traditionally reported socioeconomic variables, and the relationship to varying levels of medication adherence in rural and underserved communities in the stroke belt, may inform the development of specific interventions that are more tailored for rural populations.

The larger cohort study from which this study was derived examined factors associated with disparities in blood pressure (BP) control patterns. Our hypothesis for this study was that perceived social standing (reflecting perceived role functioning and role potential and likely influenced by life-course events) may directly influence self-care behaviors such as medication adherence, which in turn may influence BP. Individuals with lower perceived social standing in the community may perceive less need/less value regarding engagement in self-care behaviors, including medication taking, based on their perceptions of themselves.

Therefore, the aims of this study were to examine the relative importance of perceived social standing versus traditional objective socioeconomic variables as correlates of lower medication adherence in a rural community-based setting in the southeastern United States, and to characterize the relationship of lower medication adherence with BP, an important clinical outcome. We also sought to examine if these patterns regarding social standing in the community were similarly observed in both African Americans and whites in this southern rural community. The relative importance of these associations may help guide the development of rural and culturally tailored interventions for patients with hypertension and medication nonadherence.

Methods

This cross-sectional study used data collected at baseline in a longitudinal cohort study, which took place in 2011-2014 in an impoverished rural county (ie, non-Metropolitan Statistical Area) in North Carolina with a large minority population. The design and rationale for the cohort study from which these data were obtained have been previously published.[14] Briefly, the purpose of the larger cohort study was to examine the pragmatic effectiveness of implementing quality improvement strategies designed to improve BP control and reduce racial disparities in BP control across 6 primary care practice settings. The practices included 3 private practices, a hospital-owned practice, and 2 community health centers. These practices varied in size from single provider practices to multispecialty group practices. Patients in the study cohort were recruited among active hypertensive

patients attending 1 of the 6 primary care practices. Patients were identified and referred by each practice as follows. Three rural practices provided a list of adult patients with a history of at least 1 visit in the last year with an uncontrolled systolic BP measurement (systolic mmHg). Three rural practices were not able to generate a list from their electronic health record and a revised recruitment strategy was developed for them. In these 3 practices, staff members documented the office BP measurement for each adult patient with an established diagnosis of hypertension seen during routine patient care and faxed these lists to study personnel weekly. Study personnel then identified patients from these submitted lists with a diagnosis of hypertension and an uncontrolled systolic BP (systolic BP >150 mmHg). For all 6 practices, each identified patient received a mailed letter, signed by the primary care practice leader(s), inviting them to participate in the study. Approximately 1 week later, each of these potential study patients received a phone call from the research staff to determine interest and eligibility. Each potential study patient was invited to schedule an appointment to learn more about the study. Each patient was offered a $40.00 gift card for completing the enrollment visit and baseline blood work. Recruitment of the final cohort varied widely across the 6 rural practices as follows: Practice 1: 29.0% of the cohort; Practice 2: 40.6% of the cohort; Practice 3: 3.6% of the cohort; Practice 4: 11.2% of the cohort; Practice 5: 9.7% of the cohort; Practice 6: 5.9%. The overall refusal rate among patients approached for participation was approximately 45%.

Baseline Visit and BP Measurement

For the baseline enrollment visit, each patient visited a separate study coordinating center in the county and provided informed consent approved by the University of North Carolina-Chapel Hill's Institutional Review Board. Consenting patients had their BP measured at the coordinating center, using standard techniques, in the seated position 3 times and averaged; they also provided detailed demographic and medication adherence responses on questionnaires coordinated by trained research assistants.

Perceived Social Standing Measure

Perceived social standing in the community was assessed using a validated self-anchoring scale with a pictorial format (Figure 1) representing a 10-rung "social ladder," which allows the respondents to consider their past and present social circumstances to more accurately describe their perceived social status.[15,16] This measure was originally developed based on a premise that societies are structured in hierarchies like ladders, with the rungs representing the resources and/or social capital necessary to live a prosperous, healthy, and secure life. The investigators included this measure because of the limitations of traditional socioeconomic measures in rural impoverished communities and because of prior work with the instrument including examining the role of race.[12,13,15] The authors posited that perceived social standing may have a profound impact on health behaviors, including medication-taking behaviors, regardless of the influence of more traditional measures of socioeconomic status (ie, education, income). For example, some individuals, despite limited income and education, may perceive an elevated social standing in the local community that may positively influence health behaviors. Finally, we examined whether perceived social status and its impact on medication-taking behaviors may be fundamentally different in different racial groups. The investigators specifically asked patients to evaluate their

perceived social standing relative to “others in their community” because our anecdotal experience suggested that some individuals in impoverished rural communities may perceive a high level of social standing despite having limited income and education. Patients were shown a picture of the ladder (Figure 1) and were asked to rate their own standing in comparison to others in their community (score = 1-10 with higher scores indicating higher perceived social standing).

Demographic and Socioeconomic Measures

Traditional demographic information collected included date of birth/age, self-identified race (primarily African American and white participants in this study), gender, highest education level completed, current health insurance status (presence of any health insurance), and household income in the last year, assessed in a 13-category scale ranging from <$5,000/year to ≥$100,000/year.

Medication Adherence Measures

Medication adherence was assessed using the 8-item Morisky Medication Adherence Scale (MMAS), a well-validated self-report measure of medication adherence (score range 0-8 with 8 being perfect medication adherence and <6 being indicative of inadequate medication adherence; $\alpha = 0.83$).[17] The MMAS has been used for many years in medication adherence research with the current 8-item scale adapted from an earlier 4-item version to more specifically address potential challenges or barriers to optimal adherence. The instrument has also been previously used among African Americans and whites with hypertension in North Carolina to explore racial differences in BP control.[18] In a small subsample, community pharmacy fill/refill data were available for antihypertensive medications as an additional measure of medication adherence. The investigators sought to better understand the extent to which self-reported medication adherence was consistent with adherence as estimated from pharmacy fill/refill data. This subsample included 32 patients attending just one of the rural practice sites who: (1) provided additional consent for review of pharmacy records, (2) obtained their personal medication fill/refill data for a 1-year period prior to the enrollment date from the local pharmacy, and (3) made these records available to the study center for review. Using these data, the individual medication possession ratio (MPR) was calculated for each subsample patient as follows: number of days’ supply divided by [last refill date - first refill date + days’ supply of last refill date].

Potential Reasons for Medication Nonadherence Measure

The patient was asked to bring in all medication containers, and all medications and dosages were recorded at the enrollment visit and the antihypertensive medications identified. Patients were asked a series of investigator-developed questions that explored potential reasons for inadequate medication adherence including possible side effects, cost-related nonfilling or stretching out of medications, and perceived need to continue therapy. Questions about experiences with side effects included a list of possible drug-induced symptoms and the patient was asked to “mark all that apply.” Five questions asked about potential cost-related adherence behaviors, asking how often in the last 3 months the patient did each of 5 possible behaviors ranging from “not filling a prescription because of cost” to

"use of herbal medicines or vitamins rather than my prescription medicine because of the cost." Each question had 4 response options ranging from "at least once a week" to "never."

Statistical Analysis

Traditional demographic [age, race (African American and white) and gender] and socioeconomic [highest grade/education achieved and annual household income] characteristics and perceived social standing (10-item scale) were initially examined using descriptive statistics. Pearson correlation, *t* test, and chi-square analysis, for continuous and categorical variables, respectively, were used to examine bivariate relationships between demographic and socioeconomic variables, perceived social standing, and both MMAS and systolic BP. Responses to the 5 investigator-derived cost-related nonadherence questions were recoded for analysis into 2 responses: "at least once a month up to once a week," which was considered as practicing cost-related nonadherence behaviors; and "very rarely or never" responses, which were considered as not practicing cost-related nonadherence behaviors. Patients using one or more of these cost-related strategies were identified.

Stepwise linear regression was used to examine the relationship of traditional demographic and socioeconomic characteristics (age, race, gender, highest education level, annual household income) and perceived social standing (10-item scale) with self-reported medication adherence (MMAS score ranging from 0 to 8) as the outcome of interest. The initial model included age, race, and gender. The second model added highest education level and annual household income, and the final model added perceived community social standing score. Subsequently, an interaction term for race times perceived social standing was introduced into the model. Finally, race-specific regression models were examined in African Americans and whites to clarify race-specific relationships.

To examine the relative clinical importance of medication adherence (MMAS score) and its relationship to BP, a second series of linear regression models were constructed with baseline systolic BP as the outcome of interest, MMAS score as the independent variable, and with age, race, gender, education level, and annual household income as covariates. The initial model included age, race, and gender. The second model added highest education level and annual household income, and the final model added medication adherence (MMAS score). Data were analyzed using SPSS version 20 (IBM Corporation, Armonk, New York).

Results

Patients

While the initial cohort contained 525 patients with a history of uncontrolled hypertension referred from primary care practices, only 495 had complete data available for this analysis. Demographic, socioeconomic, and clinical characteristics are given in Table 1. African Americans had a significantly higher mean perceived social standing than whites (6.8 vs 6.2; $P < .005$) despite significantly lower annual household income (75% vs 57% with annual household income <$40,000).

Initial Relationships With Medication Nonadherence

There were no significant differences in mean MMAS scores or mean systolic BP across the 6 practices. Approximately 40% of patients had an MMAS score of <6, indicative of inadequate medication adherence. The pharmacy claims data were used to calculate MPR from a subsample of 32 patients and demonstrated moderate correlation with the MMAS score (Pearson correlation coefficient = 0.54, $P = .001$). There was a significant correlation between perceived social standing in the community and both medication adherence (MMAS score) (r = 0.13, $P < .01$) and annual household income (r = 0.18, $P < .01$). Table 2 shows bivariate comparisons of demographic and socioeconomic characteristics by medication adherence category based on the MMAS score (<6 vs ≥6). Those with medication nonadherence (MMAS < 6) were significantly younger, more likely to be African American, more likely to be uninsured, and more likely to have lower perceived social standing (Table 2). Annual household income and highest education level were not significantly different between adherence groups (Table 2).

Figure 2 shows that among African Americans who reported low perceived social standing, there was a significantly higher proportion of patients reporting medication nonadherence, while no significant relationship was evident among whites. Those reporting nonadherence (MMAS < 6; n = 197) had a higher mean systolic BP (140 ± 24 mmHg vs 137 ± 21 mmHg; $P = .23$) and a significantly lower mean number of antihypertensive medications (2.1 ± 1.3 vs 2.4 ± 1.2; $P = .02$). Among those reporting medication nonadherence (MMAS < 6; n = 197), only 38% endorsed a cost-related reason for nonadherence. By contrast, among those reporting nonadherence, 75% reported that, on one or more occasions, they had stopped or reduced the dosage of an antihypertensive medication because it made them feel worse, without calling the doctor's office.

Multivariate Analysis: Correlates of Medication Adherence Score

In multivariate regression modeling, we examined the independent association of traditional demographic and socioeconomic variables and perceived social standing with medication adherence (MMAS score); results are given in Table 3. Age (younger), race (African American), and lower perceived social standing but not traditional socioeconomic factors (ie, highest education level completed and household income) were significantly associated with lower medication adherence. However, as evidenced in Figure 2, the significant relationship between perceived social standing and medication nonadherence was observed in African Americans but not in whites. When an interaction term for race times perceived social standing was introduced into the model, neither race ($\beta = -0.49$; $P = .24$) nor perceived social standing ($\beta = 0.02$; $P = .85$) were significant independent correlates of medication adherence. To further investigate the relationship between race and perceived social standing and medication adherence, the investigators ran race-specific regression models. Among African Americans only (n = 297), both age ($\beta = 0.025$; $P = .0001$) and perceived social standing ($\beta = 0.09$; $P = .011$) were independent correlates of medication adherence. Among whites only (n = 198), neither age ($\beta = 0.011$; $P = .19$) nor perceived social standing ($\beta = 0.07$; $P = 0.15$) was significantly associated with medication adherence.

Multivariate Analysis: Correlates of Systolic BP

As expected, systolic BP was significantly and positively correlated with increasing age (Pearson correlation = 0.31, $P < .001$). In a series of stepwise linear regression models, we examined the association of demographic and socioeconomic factors (age, race, sex, highest education level, and annual household income), and medication adherence (MMAS score) with measured systolic BP as the clinical outcome of interest. As shown in Table 4, age (older), race (African American), and lower medication adherence scores but not traditional socioeconomic factors (ie, highest education level completed and annual household income) were significantly associated with higher levels of systolic BP.

Discussion

Evaluating patients with uncontrolled hypertension in rural community-based practices is a common scenario, and medication nonadherence is often suspected. While much data have been collected regarding medication nonadherence in different settings, little is known about the prevalence and correlates of medication nonadherence in the subset of individuals with uncontrolled hypertension who present in rural primary care practices in the southeastern United States, often described as the “stroke belt.” This study uniquely addresses this population and reveals a self-reported medication nonadherence rate of approximately 40%, with a modestly greater prevalence among younger individuals, African Americans, and the uninsured. These findings are consistent with other studies of medication nonadherence.[1-3] In contrast to some prior reports, however, we found that traditional socioeconomic characteristics, including highest education level completed and annual household income level, were not significantly associated with medication adherence.[5] Instead, this study demonstrates a stronger relationship of medication adherence with the patient’s own perceived social standing in the community, specifically among African Americans. This differential finding by race is consistent with prior research on socioeconomic status in the CARDIA study[19] in which annual income was associated with perceived social standing in whites but not in African Americans.

Prior research by Cené and associates has demonstrated that there are important differences by race in perceived social standing that are unrelated to annual household income.[20] African Americans appear to gauge social standing in their community in ways that are not closely related to traditional socioeconomic characteristics. Adler et al[16] suggest that as patients evaluate their own social standing in the community, they may consider past circumstances and experiences, family history and resources, future prospects and opportunities, as well as psychological factors that affect current and future health trajectories. Higher perceived social standing, particularly among African Americans, may also suggest specific access to support systems and social capital that may have positive and beneficial effects on health behaviors including medication adherence behaviors. Thus, this global assessment of social standing appears to be more strongly associated with a variety of health outcomes, including medication adherence, than traditional socioeconomic characteristics in rural-dwelling African Americans, and suggests that it should be more consistently evaluated. Additional research is needed regarding the prevalence and

conceptualization of perceived social standing in rural and minority communities and how this might be leveraged to improve health behaviors.

Patients reporting nonadherence had a significantly lower mean number of antihypertensive medications than adherent patients. It is unclear if this reflects underreporting by nonadherent patients, inadequate treatment intensification by providers because of nonadherence concerns, or other factors.

Of particular interest, patients reporting nonadherence endorsed cost-related reasons as a cause only approximately 38% of the time. However, the majority of patients had, on at least 1 occasion, stopped or reduced the dose of an antihypertensive medication because it made them feel worse. This finding underscores the relative importance of drug-related side effects as a potential cause of nonadherence. These data suggest that rural primary care practices and local pharmacies might benefit from more careful and directed questioning regarding non-cost-related reasons for nonadherence. While cost-related nonadherence has received considerable attention, our findings suggest that a broader range of patient-specific barriers to adherence need to be explored in this setting and used to develop a culturally tailored strategy for improving adherence.

This study shows that medication nonadherence remains as a significant problem in rural southern communities and that it is significantly related to perceived social standing among African Americans. Furthermore, the study demonstrates that both higher systolic BP values and racial disparities in BP control persist in these communities and are associated with medication nonadherence. New strategies to more directly investigate patient-perceived social standing as a predictor of medication nonadherence, particularly among African Americans, are needed.

This study has a number of limitations. The study was cross-sectional in nature so a causal relationship between demographic and socioeconomic characteristics, medication nonadherence, and systolic BP cannot be established. The study included only African American and white patients in the rural southeastern United States; extrapolation to other racial groups or other locations cannot be assumed. Approximately 40% of individuals chose not to participate so some selection bias may be present in the findings.

In conclusion, in rural southern communities, medication nonadherence is prevalent and among African Americans in the community is more strongly associated with perceived social standing than with traditional socioeconomic characteristics. Medication nonadherence contributes to elevated BP, and it is not always cost-related. Despite national attention on medication nonadherence, these problems persist and new office- and community-based strategies need investigation. Specifically, our findings suggest the need for more tailored and culturally relevant medication adherence interventions to facilitate BP control.

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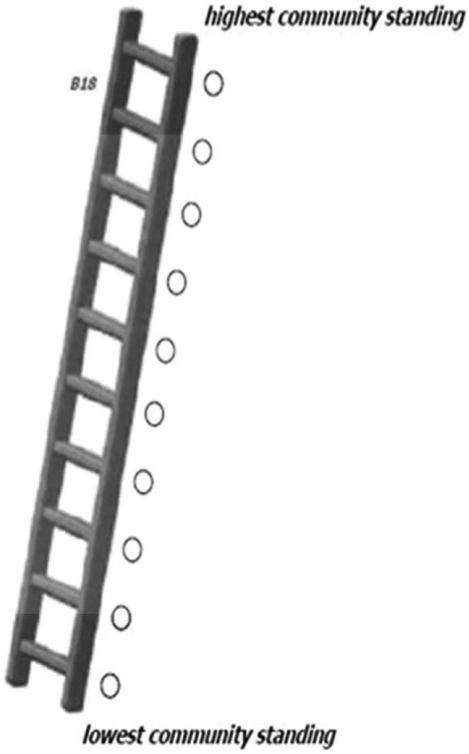

Figure 1.
Ten-Rung Perceived Social Standing in the Community Measure.[a]

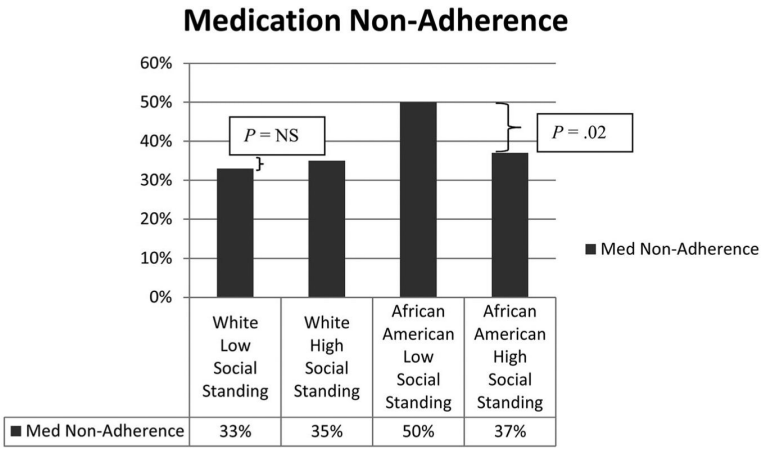

Figure 2.

Relationship Between Perceived Social Standing in the Community and Medication Nonadherence (MMAS<6.0) by Race Among Rural Patients With a History of Uncontrolled BP.

Table 1

Demographic, Socioeconomic, and Clinical Characteristics of the Cohort at Time of Enrollment (n = 495)

Parameter	Value
Mean age (yr.)	57.3 ± 12.8
Race (% African American)	60%
Gender (% female)	68%
High school education or less (%)	72%
Annual household income (% <$40,000/yr.)	68%
No health insurance (%)	26%
Mean systolic BP at enrollment center (mmHg)	139 ± 22
Mean number of antihypertensive medications	2 ± 1.4

Table 2

Comparison of Traditional Demographic and Socioeconomic Characteristics and Low Perceived Social Standing in the Community in Rural Patients With a History of Uncontrolled Hypertension by Medication Adherence Status

Parameter	Adherent (n = 298) (MMAS ≥ 6)	Nonadherent (n = 197) (MMAS < 6)	*P* value
Mean age (yr.)	59.3 ± 11.4	54.9 ± 14.1	< .001
Race (% African American)	60%	69%	.05
Gender (% male)	33%	32%	.85
High school education or less	74%	73%	.90
% Uninsured	22%	31%	.03
Household income % <$40,000/yr.	69%	70%	.98
% Perceived community standing in lowest tertile	25%	34%	.09

Table 3

Final Multivariate Model Examining Characteristics Associated With Medication Adherence (MMAS score) in Rural Primary Care Patients With a History of Uncontrolled BP

Parameter	Final Model β (95% CI)	*P* value
Age (yr.)	0.20 (0.01-0.03)	.001
Race	−0.30 (−0.60–0.4)	.03
Gender	−0.06 (−0.3-0.2)	.70
Highest education level	0.03 (−0.3-0.3)	.85
Household income/yr.	−0.05 (−0.2-0.1)	.62
Standing in community	0.08 (0.03-0.14)	.002

Table 4

Final Multivariate Model Examining Characteristics Associated With Systolic BP in Rural Primary Care Patients With a History of Uncontrolled BP

Parameter	Final Model β (95% CI)	*P* value
Age (yr.)	0.57 (0.40-0.74)	.001
Race	4.4 (0.47-8.4)	.03
Gender	−3.7 (−7.7-0.21)	.06
Highest education level	1.8 (−2.5-6.2)	.40
Household income/yr.	0.60 (−2.4-3.6)	.70
Medication Adherence (MMAS)	−1.7 (−3.1–0.41)	.01