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Predictors of Healthcare System and Physician Distrust In Hospitalized Cardiac Patients

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Abstract

A trusting relationship between patients, physicians, and the healthcare system is important in encouraging self-care behaviors in cardiovascular patients. The study aimed to assess the prevalence of healthcare system and physician distrust in this population, compare the two forms of distrust, and describe the demographic, socioeconomic, and psycho-social predictors of high distrust. 1232 hospitalized adults with acute coronary syndrome or heart failure were enrolled in a prospective, observational study assessing both healthcare system and physician distrust. High healthcare system distrust (35%) was observed across the population, with lower levels of interpersonal physician distrust (16%). In a multivariate analysis, poor social support and coping skills were strong predictors of both healthcare system ($p = 0.026$, $p = 0.003$) and physician distrust ($p < 0.001$, $p = 0.006$). Individuals with low or marginal health literacy had a higher likelihood of physician distrust ($p < 0.001$), but no relationship was found between health literacy and healthcare system distrust. In conclusion, distrust is common among acutely ill cardiac patients. Those with low social support and low coping skills are more distrusting of physicians and the healthcare system.

Keywords

trust; healthcare system; health literacy; cardiovascular disease

Introduction

Cardiovascular disease affects over 85 million American adults and is responsible for one in every three deaths nationally (Go et al., 2014). Furthermore, it accounts for more hospital discharges than any other disease category (Krumholz et al., 2009). Delays in seeking medical care for acute coronary syndrome (ACS) or heart failure (HF) may result in higher morbidity and mortality (Moser et al., 2006). At discharge, cardiac patients receive complex recommendations which are important not only after leaving the hospital, but also for years to come if they are to achieve the most benefit from evidence based therapies (Jneid et al., 2012; Tamis-Holland & O’Gara, 2014). For these reasons, optimal management of a hospitalized patient with cardiovascular disease requires there to be an effective relationship between the patient, his physician, and the healthcare system as a whole.

Trust is the foundation of effective relationships. It has previously been defined as “intuitive confidence and a sense of comfort that comes from the belief that [patients] can rely on an individual or organization to perform competently, responsibly, and in a manner considerate of [patients’] interests” (Barber, 1983). It is a growing concern for healthcare providers because it is considered an “essential element in diagnosis, treatment, and healing” (Jacobs, 2005). Research suggests that there is a progressive decline in how medicine as an institution is perceived by the public (Taylor, 2008). The growth of managed care and changes in physician payment models may contribute to public concern that healthcare organizations are not trustworthy (Mechanic, 1998b). Media portrayals of medical errors, malpractice cases, and conflicts of interest also influence public perception of the medical system (Mechanic, 1998a; Pearson & Raeke, 2000; Rowe & Calnan, 2006). A patient must have sufficient trust in the medical system to seek timely care, making general societal perceptions of the institution potentially more critical in patients with cardiovascular disease. In contrast to the broader concept of healthcare system trust, measures of physician trust have relied on patients’ impressions after a face-to-face outpatient clinical encounter (Anderson & Dedrick, 1990). Dependability, confidentiality, fidelity and honesty are components of interpersonal trust scales and demonstrate the importance of a patient’s subjective assessment of a physician (Hall, Zheng, et al., 2002). A diagnosis of heart failure or acute coronary syndrome may require urgent admission, extensive workup, and have a significant risk of mortality. This may result in a heightened sense of vulnerability and cause patients to be particularly sensitive to issues of trust. Though patients generally have trust in their primary physicians, those admitted to a hospital with an acute illness are likely to be cared for by multiple unfamiliar providers in the course of one hospitalization and must trust the institution of medicine before engaging in this care. This additional degree of vulnerability and stress may make judgments of trust even more central to patient practices post-discharge. The components of institutional and interpersonal trust have been proven to be distinct in multiple studies, making it necessary to include both in a full assessment of trust. A prior study even showed a progressive decline in surrogates’ healthcare system distrust during a hospital stay, though physician trust levels remained constant (Schenker, White, Asch, & Kahn, 2012).

The conceptual framework of patient characteristics and relationship to health outcomes is demonstrated in Figure 1 (Meyers et al., 2014). In this model, we suggest that social

determinants of health (including demographic attributes, socioeconomic standing, health literacy, and social support) and patients' underlying health status affect patients' relationship with the medical system and physicians, as well as self-care. These factors in turn influence outcomes after hospital discharge including functional status, health-related quality of life, healthcare utilization, and mortality.

Demographic characteristics, health literacy, numeracy, depression, and decision-making styles have all individually been studied as predictors of trust (Kayaniyil et al., 2009; Kraetschmer, Sharpe, Urowitz, & Deber, 2004; Rodriguez et al., 2013). Demographic relationships have been inconsistent with studies suggesting that female, elderly and less educated patients are more trusting (Bell et al., 2013; Kayaniyil et al., 2009), and other studies showing the opposite (Bonds, Foley, Dugan, Hall, & Extrom, 2004). One study did not demonstrate any relationship in trust levels by economic status, physical or mental health, or level of social support (Bonds et al., 2004). However, as age, sex, educational level, socioeconomic status, and living alone are associated with increased delays in seeking treatment, these demographic characteristics may be relevant when investigating trust (Moser et al., 2006). These characteristics may need to be studied in combination with other social determinants of health in order to identify the most relevant predictors of patient outcomes. Depression may influence a patient's assessment of trustworthiness and willingness to engage in care, and was therefore included in this analysis of trust. Cardiac patients may be discharged with new prescriptions, dietary guidelines, and exercise recommendations, (Jneid et al., 2012), all of which are important in minimizing morbidity and mortality. An inability to adequately understand and therefore trust the accuracy of these recommendations may be a barrier to achieving an effective patient-physician relationship and subsequent adherence. Therefore, inadequate health literacy may also prevent engagement in care. Though interpersonal trust has been examined previously in a small heart failure study (Wu, Moser, Chung, & Lennie, 2008), the nature of both institutional and interpersonal trust in a large cardiovascular inpatient population has not been described.

With this in mind, we had three specific aims for this study. The first was to assess the prevalence of physician and healthcare system distrust in an inpatient cardiac population. The second was to determine the relationship between these two types of distrust. The third was to describe demographic, socio-economic, and psychosocial predictors of individuals with high healthcare system and physician distrust. We were particularly interested in the relationship between distrust and health literacy.

Methods

Study Design and Participants

The Vanderbilt Inpatient Cohort Study (VICS) is a prospective observational study of patients admitted with acute coronary syndrome (ACS) or acute decompensated heart failure (ADHF) to Vanderbilt University Hospital (VUH), an academic tertiary care hospital. The purpose of VICS is to investigate the impact of socio-demographic factors on post-discharge health outcomes such as readmission, quality of life, and mortality.

A detailed description of study methods and aims is previously published (Meyers et al., 2014), but a brief description follows. The sample for the current study included individuals over the age of 18 enrolled consecutively between October 2011 and January 2013 who completed baseline interviews. Eligible participants presented to VUH or were transferred to VUH within 7 days of initial presentation and met clinical criteria for intermediate to high likelihood of ACS or ADHF based on a clinician's review of the patient's chart. All new admissions in the electronic medical system are screened for eligibility including direct admissions to the cardiac catheterization lab and patients undergoing evaluation in the emergency room. The majority of patients are cared for by dedicated cardiovascular services composed of either housestaff or nurse practitioners and supervised by cardiology attendings. Teams rotate intermittently, but overall patients have a consistent team through the duration of their admission.

Study Procedures

After obtaining consent, research assistants completed an in-person interview with each participant and data were entered directly into the Vanderbilt-developed Research Electronic Data Capture (REDCap) (Harris et al., 2009) platform via a tablet computer. Participants completed a series of baseline questions and validated measurements to assess demographics, self-reported race, ethnicity, educational attainment, and marital status. Household income was collected using the strata from the Behavioral Risk Factor Surveillance System (BRFSS) questionnaire ((CDC)).

An extensive social support assessment was achieved by utilizing multiple scales with varying areas of focus. Items from the Midlife Development in the United States (MIDUS) (Seeman et al., 2011) survey assess frequency of contact and level of support provided by family, friends, and neighbors while the Health Retirement Survey (HRS)(Smith, 2013) primarily focuses on number of close friends and family members. The ENRCHD Social Support Inventory (ESSI) assesses four attributes of social support: emotional, instrumental, informational, and appraisal (Mitchell et al., 2003). Higher scores on the ESSI signify higher levels of overall social support with the highest possible score of 30. This scale has not only been developed within and validated for a cardiac population, but has also been correlated to patient outcomes.

Health literacy was assessed using the short form of the Test of Functional Health Literacy in Adults (s-TOFHLA), an objective assessment of reading fluency. Scores on the s-TOFHLA are broken into three categories: inadequate (0–16), marginal (17–22), and adequate health literacy (≥ 23) with a possible total of 36 points. Additionally, the Brief Health Literacy Screen (BHLS), on which patients subjectively assess their ability to complete forms and understand health information, was included to capture additional dimensions of health literacy (Chew et al., 2008; Wallston et al., 2014). Though some tests of health literacy require the application of basic numeracy skills, tests of numeracy specifically evaluate a patient's ability to perform simple calculations and interpret data. The Subjective Numeracy Scale (SNS) was included because it gives a subjective assessment of numeracy skill without inciting the degree of personal stress that objective numeracy assessments may cause (Fagerlin et al., 2007; Wallston, McNaughton, Storrow, Cavanaugh,

& Rothman, 2011). Assessments of literacy and numeracy require some common skills, but studies have found that even individuals with a high school education may have difficulty with simple calculations and data interpretation (Lipkus, Samsa, & Rimer, 2001).

The presence and severity of depressive symptoms was measured using the Patient Health Questionnaire (PHQ-8), which consists of 8 questions and three possible points per question. Scores range from 0 to 24 with the following categories: no depression (0–4), mild depression (5–9), moderate (10–14), moderately severe (15–19), and (20–24) severe depression (Kroenke et al., 2009).

Given the need for an individual to assess and respond to symptoms in both ACS and CHF we included the 4-item Brief Resilient Coping Scale (BRCS) to assess ability to cope with stress in an adaptive manner (Sinclair & Wallston, 2004).

Outcomes

Revised Healthcare System Distrust Scale (HCSD)—Distrust in the healthcare system in general (systematic or institutional distrust) was measured during the initial enrollment interview using the 9-item revised Healthcare System Distrust Scale (Shea et al., 2008). This scale has scores ranging from 9 to 45 and asks patients to assess the values and competence of hospitals, community clinics, labs, insurance companies, and drug companies. Responses are scored on a 5-point Likert scale and higher scores signify high levels of institutional distrust. Values and competence sub-scales were included in this measure. We normalized scores, giving a range of 0 to 36. Based on average potential scores, groups were divided into low (< 9), moderate (10–18), and high (> 19) distrust categories for descriptive statistics. This scale demonstrated normally distributed scores during initial development, has been strongly associated with self-reported health status, and has been validated in a diverse population (Rose, Peters, Shea, & Armstrong, 2004).

Wake Forest Physician Trust Scale (WFPT)—Patients were asked to complete the Wake Forest Physician Trust questionnaire during a follow-up call within the first week after discharge. They were directed to answer with specific reference to their recent interaction with their physician during the inpatient admission (Hall, Zheng, et al., 2002). Domains of competence, fidelity, honesty, confidentiality, and global trust domains were used in creation of this scale. This 10-item scale has scores ranging from 10 to 50. To normalize scores, we subtracted ten and the resulting range was 0 to 40. This value was inverted to equate higher scores with increasing levels of interpersonal *distrust*, allowing for the same directional comparison of the institutional and interpersonal scales. Based on average potential scores, groups were divided into low (< 10), moderate (11–20), and high (> 21) distrust categories. The WFPT scale has been correlated with patient satisfaction and objective measures of disease control (Hall, Zheng, et al., 2002).

Statistical Methods

Frequencies and percentages were calculated for categorical variables, and the 10th, 50th, and 90th percentiles were calculated for continuous variables. For the univariate analysis [Table 1], the chi-square test and Kruskal-Wallis tests were applied to categorical and

continuous variables to assess for significant differences between each covariate and levels of distrust. Healthcare system and physician distrust score distributions are summarized graphically [Figure 2].

Proportional odds (i.e., cumulative logic) regression models were used to examine risk factors associated with the log odds of greater healthcare system and physician distrust scores. The proportional odds model allows for multiple ordered response categories and is an extension of a standard two-category logistic regression model. The proportional odds model corresponds to the odds of reporting a higher distrust score versus having less distrust, associated with a one unit increase in covariate value given that all of the other variables in the model are held constant.

The following covariates were selected *a priori* and included in the regression models: age, gender, race, education, marital status, employment status, income, diagnosis, social support (using the ESSI, MIDUS, and HRS measures), health literacy (using the s-TOFHLA and BHLS), subjective numeracy, depression, and coping skills. Health literacy, numeracy, mental health, and decision-making styles have previously been reported in the literature as possible contributors to distrust.

To determine the extent of flexibility required to describe continuous covariate effects on outcomes, all continuous predictors were entered into each of the two regressions using highly flexible, restricted cubic splines with 5 knots. The Chi-square, likelihood ratio test statistic minus the degrees of freedom for each covariate effect was then plotted to determine the contribution of each variable to the model (Frank E Harrell, 2010). The number of knots used on each variable was determined based on a visual inspection of the variable importance plot. Further, non-linear effects were removed only if the corresponding p-value for the non-linear component was greater than 0.25. The use of a high p-value to reduce the flexibility of the covariate effect indicates that we erred on the side of flexible, non-linear covariate effects and only used linear effects if there was no evidence of non-linearity. Further, if a covariate effect was observed to be non-linear in either the healthcare system or physician distrust model, it was left as non-linear in both models. After this examination for non-linearity, covariates health literacy (s-TOFHLA), coping, and depression were modeled flexibly using restricted cubic splines with 4 knots to permit non-linear covariate effects on outcomes. Age, social support (ESSI) and subjective numeracy were also modeled using restricted cubic splines with 3 knots.

Nonlinear associations were plotted for age, ESSI, s-TOFHLA, SNS, PHQ and BRCS, and the adjusted odds ratios and point-wise 95% confidence intervals were calculated over the range of the variable. For the nonlinear association plots, the range was restricted to the 1st percentile to the 99th percentile of the observed variable. Analyses were performed in R version 3.0.1 (Vienna, Austria). A Cronbach's alpha was calculated for the revised Healthcare System Distrust Scale within this population as well.

Results

Subject Characteristics

A total of 1232 patients were enrolled between October 2011 and January 2013 and completed the HCSD measure while hospitalized. A total of 1102 patients (90% of enrolled patients) went on to complete the WFPT measure during the follow-up phone call.

Among all participants the mean age was 60 (SD=12.7), 46% were female, and 83% were white. The diagnosis of ACS was identified in 64%, HF in 28%, and both ACS and HF in 8%.

Mean score on the s-TOFHLA was 29.3 (SD=8.0). Inadequate literacy was noted in 11% of patients, marginal in 8%, and adequate in 81%. The mean BHLS score was 11.5 (SD=3.2) with 24% having low literacy and 76% having adequate literacy. The mean SNS (subjective numeracy) score was 4.4 (SD = 1.4).

Prevalence of Distrust

Patients completing the healthcare system distrust questionnaire demonstrated a relatively high prevalence of distrust with 12% reporting mild distrust, 53% moderate, and 35% with high levels of institutional distrust. In comparison, patients who completed the physician distrust questionnaire at the discharge follow-up call reported 20% with no distrust, and only 16% with high levels of interpersonal distrust related to their hospital physician. Cronbach's alpha for this measure was (0.855).

Figure 2 displays the relationship between the HCSD and WFPT scores, demonstrating a normal and wide spread distribution of HCSD scores across the scale. In contrast, the WFPT scores displayed a skewed distribution of the inter-personal physician trust scores with a majority of participants reporting a high level of trust in their physician. Spearman coefficient of the two measures demonstrated a poor correlation (0.20).

Characteristics of Distrust

Patient demographics and baseline characteristics are summarized within the stratified distrust score ranges in Table 1.

In unadjusted analyses, increasing health care system distrust was associated with socio-demographic variables of age, sex, years of education, and employment status, but was not associated with race, marital status, income, or diagnosis. Objective literacy as measured by the s-TOFHLA did not demonstrate a significant relationship to institutional distrust, but there was a significant relationship with subjective health literacy (BHLS) and numeracy (SNS). Overall distrust in healthcare systems was associated with increasing depression, reduced coping skills, and a paucity of meaningful social relationships as measured by the ESSi. Social contact with friends and family members as measured by the HRS and MIDUS, however, were not significant.

In unadjusted analyses, increasing inter-personal physician distrust was associated with age. There was not a significant relationship with sex, race, education, marital status,

employment status, income, or diagnosis. There was a significant relationship with both subjective and objective assessments of health literacy (BHLS, s-TOFHLA) and with all measures of social support (ESSI, HRS, MIDUS). Lastly, lack of coping skills was also significantly associated with physician distrust. There was not a significant relationship to subjective numeracy skills (SNS) or levels of depression (PHQ).

Predictors of Healthcare System Distrust

Figure 3 demonstrates a multivariate analysis of healthcare system distrust with a) representing the linear variables and b) representing the non-linear variables. The y-axis represents increasing odds of healthcare system distrust, ranging from 0.25 to 4. When adjusted for all covariates displayed, race, marital status, income, health literacy (s-TOFHLA), and social support (HRS and MIDUS) remained non-significant predictors of healthcare system distrust. Sex, education, employment status, numeracy, and health literacy (BHLS) were no longer statistically significant predictors of health care system distrust. The only linear, statistically significant relationship was between heart failure diagnosis and lower likelihood of healthcare system distrust [figure 3a].

In figure 3b the variables with a non-linear relationship are displayed demonstrating the mean odds ratio and 95% confidence intervals for the continuous variable ranges. Non-linear, significant relationships were found between healthcare system distrust and lower age, low social support as measured by the ESSI, depression, and low coping skills (BRCS). Individuals below the age of 65 were shown to have lower odds of healthcare system distrust. Social support as measured by the ESSI demonstrated that individuals with the lowest levels of meaningful emotional and social support (ESSI <10) have a 2 times greater odds of healthcare system distrust than individuals with high social support levels. The odds for a higher level of healthcare system distrust was 2.22 times greater [1.48, 3.33] for individuals with moderate and severe depressive symptoms (PHQ scores ≥ 16) compared to those without depression. Lastly, those with low coping scores (BRCS ≤ 10) exhibited 2.32 times greater [1.23, 4.40] odds of increased distrust compared to those with high scores.

Predictors of Physician Distrust

Figure 4 demonstrates a multivariate analysis of predictors of physician distrust with a) representing the linear variables and b) representing the non-linear variables. For both the linear and non-linear variables, an odds ratio of 0.25 up to 4 is given on the y-axis, with increasing odds of physician distrust. When adjusted for all covariates displayed, sex, race, education, marital status, income, diagnosis, numeracy, and depression remained non-significant predictors of physician distrust. Subjective health literacy (BHLS) and social support (MIDUS and HRS) were no longer statistically significant predictors of physician distrust after adjustment. The only linear relationship that was found to be significant was between unemployed status and lower likelihood of physician distrust [figure 4b].

As demonstrated in Figure 4b, ESSI, s-TOFHLA, and BRCS demonstrated a non-linear, independent relationship to distrust. Those with a low social support score (ESSI ≤ 10) had a 3.36 times great odds of physician distrust [1.88, 6.00] compared to those with high social support. Individuals with inadequate or marginal health literacy (s-TOFHLA score of 0–16

and 17–22 respectively) had a 1.80 and 2.20 fold increase in the odds of physician distrust [1.46, 3.15]. Those with low coping scores (BRCS = 10) exhibited 1.80 times greater odds of increased physician distrust compared to those with high scores.

Discussion

In this study of hospitalized individuals with cardiovascular disease we demonstrated a high prevalence of institutional and health care system distrust (35%) and relatively lower levels of interpersonal physician distrust (16%). Patients showed more variable levels of trust in the healthcare system than in their personal physicians, consistent with prior studies (Hall, Camacho, Dugan, & Balkrishnan, 2002; Shea et al., 2008). We also found higher levels of physician distrust in our patient population as compared to previously published outpatient populations, suggesting that the continued care role of the outpatient physician may have a role in the development of a trusting relationship as compared to the transient nature of the hospital physician (Kraetschmer et al., 2004).

There was a weak correlation between the two distrust scales and multiple unique factors were independently predictive of the different components of distrust, demonstrating that these two domains of distrust remain relevant when studying an inpatient population.

In our conceptual framework model (Figure 1), we suggest that social determinants of health (including demographic attributes, socioeconomic standing, health literacy, and social support) will play a role in a patients' relationship with both the medical system and their physicians and that trust may be a central feature of this relationship. These factors in turn may influence outcomes after hospital discharge including functional status, health-related quality of life, healthcare utilization, and mortality.

Social support as measured by the ESSI was a strong independent predictor of both healthcare system and physician distrust, confirming the importance of assessing social situation when providing medical recommendations. The ESSI, as opposed to the MIDUS and HRS, was validated within a cardiac population and may capture elements of social support that are more important in this population. Lack of ability to respond to stressful situations (BRCS), though intimately connected to a person's ability to use social support resources (Sinclair & Wallston, 2004), independently predicted high institutional and interpersonal distrust even after multivariate analysis. CVD patients must emergently decide to seek medical care, undergo invasive testing, and may participate in intrusive treatments, which may account for the significance of coping skills and social support in predicting trust.

High healthcare system distrust was also independently associated with increasing depression. Studies of economically disadvantaged individuals have identified a cycle of social isolation that includes distrust of neighbors and community members, and may partially explain this relationship (Canvin, Jones, Marttila, Burstrom, & Whitehead, 2007). Though depression screening is already recommended for CVD patients (Moraska et al., 2013), it may be of enhanced benefit given the relationship to distrust. Additionally, the

concept of social isolation may provide an opportunity for team-based social support interventions for this group.

One of the most interesting findings is the magnitude of the independent relationship between inadequate or marginal health literacy (OR 1.80 and 2.20) and physician distrust in the adjusted multivariate analysis. Health literacy was not significantly associated with institutional distrust in adjusted analyses, which may support the theory that broader societal dynamics influence institutional distrust levels (Mechanic, 1998a). We postulate that patients form impressions about their hospital physicians based on the whether their instructions are understandable. Ineffective physician-patient communication regarding treatment decisions and recommendations, as would be more common with patients who have inadequate or marginal health literacy (Kripalani et al., 2010), may contribute to greater physician distrust (Mechanic, 1998a). Communicating clearly with patients of limited health literacy skills and employing techniques such as teach-back (Callahan et al., 2013) should benefit patients as well as their impression of physicians, but further study is necessary to confirm this.

To our knowledge, this study represents the largest assessment of healthcare system and physician distrust within a hospitalized CVD population. The number of patients enrolled allowed an extensive multivariate analysis and a clearer delineation of factors independently affecting physician versus healthcare system distrust.

This study does have limitations. First, the study was performed at a single site, which may limit generalizability; however, the site serves both the local population and is a tertiary referral center with patients in this sample coming from at least 15 different states. Second, the study sample is reflective of the regional population, which is predominately white and may not represent findings in a more racially diverse population. Third, we selected to focus on one measure for institutional and one measure for interpersonal distrust respectively. These measures have not been previously employed in CVD inpatients, but we believe they were suitable because they are well-validated, have been used in multiple other studies, and they address a variety of themes. Fourth, adverse events during the admission or poor patient outcomes may influence scores on the physician distrust scale, which is administered immediately post-discharge. Though this may bias the independent predictors to individuals that have worse outcomes in this specific population, we believe that the data gathered remains relevant especially as those individuals may benefit the most from evidence-based therapies. Lastly, this study did not assess the effect of distrust on healthcare utilization or mortality, though we plan to assess this in our future work.

Conclusion

We demonstrated the prevalence of healthcare system and physician distrust in an inpatient CVD population, which has not been described in the literature. The two forms of distrust were distinct, did not correlate highly with each other, and were predicted by different patient characteristics. Poor social support and lack of coping skills were significantly related to institutional and interpersonal distrust. Individuals with inadequate or marginal health literacy had a high likelihood of physician distrust. Clinicians should be aware of

these associations among hospitalized patients. Additional research is needed to confirm the relationship of physician and healthcare system distrust on outcomes following hospitalization and to identify constructive interventions.

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Figure 1. Conceptual framework of the Vanderbilt Inpatient Cohort Study [reprinted from (Meyers et al., 2014)]

Figure 2. Scatter plot demonstrating the relation between healthcare system distrust and physician distrust. Darker plots represent density of number of individuals.

Figure 3. Multivariate analysis of continuous variables and Healthcare System Distrust

(A): Forest plot displaying each linear covariate in multivariable analysis (x axis). Odds ratios are shown on the y-axis with a range of 0.25 – 4, and a dark horizontal line at 1. The reference groups for the categorical variables are male, white, married/partner, employed, income <\$25K, and diagnosis of ACS*.

(B): Graphical display of continuous variables modeled with non-linear effects and odds of healthcare system distrust. The plot shows predictive characteristics along the x-axis (Age, ESSI, s-TOFHLA, Subjective Numeracy Scale, PHQ, Brief Resilient Coping Scale). The y-axis shows increasing odds ratios of physician distrust ranging from 0.25 to 4. A horizontal line is placed at 1. Mean odds ratios are displayed with corresponding 95% confidence interval.

*The interquartile unit changes are education: 3 years, MIDUS: 7 points, HRS: 8 points, and BHLS: 4 points. Range was limited to the 1st and 99th percentile.

Figure 4. Multivariate analysis of continuous variables and Physician Distrust

(A): Forest plot displaying each linear covariate in multivariable analysis (x axis). Odds ratios are shown on the y-axis with a range of 0.25 -4, and a dark horizontal line at 1. The reference groups for the categorical variables are male, white, married/partner, employed, income <\$25K, and diagnosis of ACS*.

(B): Graphical display of continuous variables modeled with non-linear effects and odds of physician distrust. The plot shows predictive characteristics along the x-axis (Age, ESSI, s-TOFHLA, Subjective Numeracy Scale, PHQ, Brief Resilient Coping Scale). The y-axis shows increasing odds ratios of physician distrust ranging from 0.25 to 4. A horizontal line is placed at 1. Mean odds ratios are displayed with corresponding 95% confidence interval.

*The interquartile unit changes are education: 3 years, MIDUS: 7 points, HRS: 8 points, and BHL5: 4 points. Range was limited to the 1st and 99th percentile.

Table 1

Characteristics of Cohort By Level Of Distrust

Table 1: Baseline characteristics by distrust categories: continuous variables are summarized by mean $\pm$ standard deviation and categorical variables by percent.

	All	Healthcare System Distrust (HCSD)			Wake Forest Physician Trust (WFPT)				
	N=1,102	Low Distrust (HCSD score 9) N = 135	Moderate Distrust (HCSD score=10-18) N = 579	High Distrust (HCSD score 19) N = 388	p-value	Low Distrust (WF distrust score=0) N = 225	Moderate Distrust (WF distrust score=1-10) N = 698	High Distrust (WF distrust score >11) N = 179	p-value
Age	60.1 ± 12.7	57.3 ± 13.1	60.8 ± 12.9	60.0 ± 12.1	*0.023 ¹	58.3 ± 12.0	60.4 ± 12.7	61.2 ± 13.3	*0.034 ¹
Gender, female	46%	51%	42%	50%	*0.015 ²	47%	45%	45%	0.870 ²
Race					0.354 ²				0.197 ²
White	83%	83%	83%	82%		85%	83%	79%	
Black	15%	15%	16%	15%		14%	15%	20%	
Other	2%	2%	1%	3%		1%	2%	1%	
Education (years)	13.5 ± 2.9	13.5 ± 2.8	13.7 ± 2.8	13.3 ± 2.9	*0.066 ¹	13.9 ± 2.9	13.4 ± 2.8	13.5 ± 3.0	0.085 ¹
Marital Status					0.404 ²				0.724 ²
Married/living with partner	61%	62%	61%	59%		64%	61%	58%	
Separated/divorced/widowed	30%	33%	29%	30%		27%	30%	33%	
Single/never married	9%	5%	10%	11%		9%	9%	9%	
Employment Status					*0.014 ²				0.069 ²
Employed	32%	34%	33%	30%		34%	32%	27%	
Unemployed	4%	5%	5%	3%		7%	4%	2%	
Homemaker/Retired	39%	36%	41%	35%		35%	38%	44%	
Disabled	25%	25%	21%	32%		24%	26%	27%	
Annual income					0.210 ²				0.069 ²
<\$25,000	34%	32%	31%	40%		26%	36%	36%	

	All N=1,102	Healthcare System Distrust (HCSD)			Wake Forest Physician Trust (WFPT)			p-value	p-value
		Low Distrust (HCSD score 9) N = 135	Moderate Distrust (HCSD score=10-18) N = 579	High Distrust (HCSD score 19) N = 388	Low Distrust (WF distrust score=0) N = 225	Moderate Distrust (WF distrust score=1-10) N = 698	High Distrust (WF distrust score >11) N = 179		
\$25,000–\$50,000	34%	35%	35%	32%	35%	33%	37%		
\$50,000–\$75,000	13%	12%	14%	11%	14%	13%	12%		
>\$75,000	19%	21%	20%	17%	25%	18%	15%		
Diagnosis								0.503 ²	0.887 ²
ACS ³	64%	62%	62%	67%	65%	64%	64%		
Heart Failure	28%	32%	29%	26%	29%	28%	29%		
Both	8%	6%	9%	7%	6%	8%	7%		
Health Literacy (s-TOFHLA) ⁴								0.310 ¹	*<0.001 ¹
Inadequate	11%	8%	10%	14%	5%	12%	17%		
Marginal	8%	7%	7%	8%	4%	7%	12%		
Adequate	81%	85%	83%	78%	91%	81%	71%		
Health Literacy (BHLS) ⁵	11.5 ± 3.2	12.0 ± 3.2	11.6 ± 3.0	11.2 ± 3.4	12.4 ± 2.7	11.2 ± 3.3	11.4 ± 3.1	*0.030 ¹	*<0.001 ¹
Numeracy (SNS) ⁶	4.4 ± 1.4	4.5 ± 1.5	4.5 ± 1.3	4.2 ± 1.4	4.5 ± 1.4	4.3 ± 1.4	4.3 ± 1.3	*0.003 ¹	0.134 ¹
Depression (PHQ) ⁷	8.2 ± 5.3	6.6 ± 4.4	7.6 ± 5.2	9.5 ± 5.6	7.8 ± 5.4	8.2 ± 5.3	8.6 ± 5.2	*<0.001 ¹	0.212 ¹
Social Support (ESSI) ⁸	25.8 ± 4.6	26.5 ± 4.4	26.1 ± 4.1	25.0 ± 5.2	26.8 ± 4.1	26.0 ± 4.3	23.7 ± 5.4	*<0.001 ¹	*<0.001 ¹
Number of close friends and family members (HRS) ⁹	11.5 ± 13.7	13.6 ± 19.8	11.4 ± 13.1	10.8 ± 11.9	11.7 ± 11.4	11.8 ± 14.4	10.0 ± 13.6	0.066 ¹	*0.001 ¹
Contact with family, friends and neighbors (MIDUS) ¹⁰	15.6 ± 5.1	15.1 ± 4.6	15.5 ± 5.0	15.9 ± 5.2	14.9 ± 5.1	15.6 ± 5.0	16.4 ± 5.3	0.331 ¹	*0.015 ¹
Resilient Coping (BRCS) ¹¹	15.9 ± 2.2	16.9 ± 2.2	15.9 ± 2.1	15.6 ± 2.2	16.1 ± 2.4	15.9 ± 2.0	15.4 ± 2.3	*<0.001 ¹	*0.003 ¹

¹ Kruskal-Wallis² Chi-square Test

* represents statistically significant p-value (<0.05)

Abbreviations: ACS³=acute coronary syndrome; s-TOFHLA⁴= short Test of Functional Health Literacy in Adults; BHL⁵= Brief Health Literacy Screen; SN⁶= Subjective Numeracy Score; PHQ⁷= Patient Health Questionnaire; ESS⁸= ENRCHD Social Support Index; HRS⁹= Health Retirement Survey; MIDUS¹⁰= Midlife Development in the US; BRCs¹¹= Brief Resilient Coping Scale