Research Article

Sociodemographics and Medical Mistrust in a Population-Based Sample of Michigan Residents

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Abstract

Objective: Medical mistrust impacts access to care and adherence to medical recommendations. Inconsistencies in the literature demonstrate a complex relationship between sociodemographics and medical mistrust. The link between sociodemographics and medical mistrust remains inconclusive due in part to the small, clinically-based, often disease-specific samples (e.g. cancer, HIV) used to study this phenomenon. The purpose of this paper is to extend previous research by clarifying the relationship of sociodemographic characteristics with medical mistrust in a state-wide sample of community-dwelling adults. Three questions were examined to address this purpose: 1. Are there demographic differences in the perceptions of medical mistrust and its domains? 2. Does the relationship between demographic characteristics and mistrust differ by race? 3. Is there a relationship between mistrust and health-related factors (i.e., health insurance, personal provider, and self-rated health)?

Methods: A statewide cross-sectional survey with a total sample of 4,460 active telephone numbers was obtained, and these numbers were used to examine the associations between sociodemographic characteristics and medical mistrust among Michigan residents. Data collection was a two-step process involving telephone interviews, using a random-digit dialing methodology and follow-up survey mailings. Survey data using a demographic tool and the Group-Based Medical Mistrust scale were completed as one part of a larger survey data collection process.

Results: Analyses were conducted using data from 611 respondents; 88.5% (n=541) Caucasians and 11.5% (n=70) African Americans. Most interviewees were middle-aged (median = 57 years) females 66.3% (n=405) with at least a high school education 59.5% (n = 364). The mean level of total mistrust was 1.76 (SD=0.69; Range 1-5). African Americans had significantly higher overall mistrust and higher scores on all three subscales (suspicion, disparities, provider support). Effect sizes for these differences ranged from 0.675-0.978. Race moderated the relationship of age, gender, income and self-rated health with different aspects of mistrust. Respondents with less than a high school education and the lowest income had the highest level of suspicion.

Conclusions: The findings suggest that medical mistrust is not limited to racial and ethnic minority populations; Caucasians with a high school education, lower income and lower self-rated health may be distrustful of the health care system.

Medical Mistrust

Mistrust of the health care system, also known as medical mistrust, is defined as a "Tendency to distrust medical systems and personnel believed to represent the dominant culture" [1]. Medical mistrust has been linked to a failure to keep follow-up appointments [2], follow through on cancer screening recommendations [3]; adhere to prescribed medication regimens [4,5], as well as, to delayed health screenings [6]. To date, the vast majority of the literature on medical mistrust has been conducted with racial and ethnic groups who have experienced discrimination and incidents of medical malice (e.g. African Americans, Native Americans; [3,7,8]. Based on the definition of medical mistrust, researchers often compare non-Hispanic Whites' mistrust levels to those of racial and ethnic minorities finding lower levels of medical mistrust among non-Hispanic Whites. Most research focused on medical mistrust has sought to identify an important explanation for health disparities (e.g. exposure to discrimination and medical malice leads to medical mistrust and lower colon cancer screening) in racial and ethnic minority populations [9]. Results from mixed race studies have found that the levels of mistrust among non-Hispanic Whites tend to be lower than in persons of color yet the degree of difference across race/ethnicity is variable [10]. Interestingly, lower socioeconomic status, using measures of education level, income, or both, has frequently been associated with higher levels of medical mistrust [11,12]; yet few researchers have sought to purposefully disentangle the sociodemographics (e.g. income, education) from race or ethnicity when studying medical mistrust. At least two consequences result from not disentangling race/ethnicity from sociodcemograhpics in studies of medical mistrust; first, the empirical literature perpetuates the implicit bias that race/ethnicity and lower socioeconomic status are one in the same concept and second, the impact of medical mistrust on marginalized non-Hispanic White populations remains unexplored.

Sociodemographics and Medical Mistrust

The empirical research to date demonstrates a varied association between sociodemographics and medical mistrust. The link between sociodemographics and medical mistrust remains inconclusive due in part to the small, clinically-based, disease-specific samples [13] or disease-specific samples (e.g. HIV) [14] to study this phenomenon. Few studies [6,12,15] report using gender-mixed and racially mixed population-based samples to assess medical mistrust. In all of the studies utilizing mixed race and gender samples, medical mistrust is consistently higher among racial and ethnic minorities, with African Americans [16] reporting the highest levels of mistrust. Beyond race and ethnicity demographics, the remaining associations between sociodemographics and mistrust are variable. Only one study [15] reported on the interactions between race and sociodemographics, and no associations between gender and education and race on medical mistrust were found.

Gender

Gender has been found to be variably associated with medical mistrust. In several studies using single race/ethnicity samples, male gender has been associated with higher mistrust [17,18]. Most of the literature on medical mistrust, however, has been conducted with single gender samples [19]. and in samples with a gender-specific cancer (e.g. breast cancer, prostate cancer). Of the few studies using gender and racially mixed, community-based samples (similar to our study) only one [20] reported a gender differences in medical mistrust scores with men reporting higher medical mistrust. The literature remains unclear whether gender is only an issue in single race/ethnicity samples.

Age

Unlike gender, consistent results have been noted for age in that younger age is associated with greater medical mistrust. Two studies [21,22] found that younger women (less than 50) had higher levels of medical mistrust. Yet, like the studies focused on gender, the samples are truncated to a limited sample base (e.g. African American women), [21]. Three studies with gender and racially mixed samples [23-25] found that younger age (less than 40) was also associated with medical mistrust).

Socioeconomic Status

Socioeconomic Status (SES), is often associated with the level of medical mistrust with SES being assessed as family income [6] or level of education [13]. Individuals with less than a high school education often express more mistrust than individuals with more education [4,26]. Yet, not all studies find a significant correlation between levels of overall medical mistrust and education [7,22]. Two older studies found that the effect of education level varied by the specific aspect of mistrust being measured. Individuals with lower levels of education reported more suspicion of the health care system, while individuals with more education reported greater group disparities (i.e., the belief that people of their ethnic group were subjected to inequalities in the care they received; [1,27] [original author of Group Based Medical Mistrust Scale]. Still most studies, control for education in the multivariate analyses or do not report the associations between education and mistrust [10,12].

Lower income was associated with higher levels of medical mistrust among African American participants in some studies [7], but not in all studies [4,26]. Only one recent study could be found that reported these associations in other ethnic minority groups [18]; and no association was found. In several

mixed gender and race samples, lower income was associated with higher medical mistrust [6,25]; yet similar to the education sociodemographic variable, few studies have sought to untangle these sociodemographic characteristics using a mixed-race sample. Without disentangling these critical sociodemographic variables, the literature maintains an implicit bias that race serves as a proxy for lower socioeconomic status.

Health Care Factors and Characteristics

Health insurance status and having a regular health care provider are closely linked to SES which may explain why little empirical research has studied the association between these variables and medical mistrust. Two recent studies examined the association between insurance status and medical mistrust. One study [17] found no association between mistrust and insurance status (e.g. commercial, Medicaid, or uninsured) while Dale, et al. [4] found higher levels of mistrust among those with health care barriers, including being uninsured. Likewise, few studies [12,19,27] evaluated the impact of having a personal provider on medical mistrust attitudes. All reported that not having recent contact with the health care system and not having a regular provider was associated with greater mistrust.

Racial and ethnic minorities have reported worse self-rated health as compared to non-Hispanic Whites. The impact may overlap with sociodemographic variables such as access to care and having a regular provider. To avoid the impact of self-rated health on clinical outcomes and health disparities, recent research is seeking to disentangle this variable from race and ethnicity. Similar to the previously discussed sociodemographic variables, self-rated health as a health characteristic is variably related to medical mistrust. Two studies found no association [16,28] and another found an association [13]. More recently, Bustillo and colleagues [16] evaluated the mediating effect of medical mistrust between ethnic group membership and self-rated health and Quality of Life (QoL). They found that medical mistrust did mediate this relationship but only in African American men; and they reported lower levels of general and disease-specific QoL relative to Caucasian men, even after controlling for age, education, and income.

The empirical literature that attempts to disentangle the sociodemographic and health care factors and medical mistrust is in its infancy. While there is a growing body of literature to support the effect of medical mistrust on health care use, treatment recommendations and likely health disparities, any solution demands closer scrutiny to prevent the implicit assumption that only racial and ethnic minorities mistrust the system. Therefore, the purpose of this paper is to extend previous research by clarifying the relationship of sociodemographic characteristics with medical mistrust in a state-wide sample of community-dwelling adults. Three questions were examined to address this purpose: 1. Are there demographic differences in the perceptions of medical mistrust and its domains? 2. Does the relationship between demographic characteristics and mistrust differ by race? 3. Is there a relationship between mistrust and health related factors (i.e., health insurance, personal provider, and self-rated health)?

Methods

Design

A statewide, cross-sectional general survey of adults living in Michigan was conducted by the Center for Urban Studies at Wayne State University (WSU). The survey focused on how health-related issues affect individuals and families throughout the state. As part of a competitive application process, whereby faculty of WSU submit a proposal to add up to 25 questions to the statewide survey, we were able to add questions related to medical mistrust and health care access and perception. Our 19 questions were added to the larger survey, which included 65 questions. The remaining questions, provided by other faculty, focused on how Michigan residents seek and use of health information.

Study Sample and Procedure

Research staff from the Center for Urban Studies purchased a random-digit dialing sample of Michigan telephone numbers. The list was checked against known disconnected or business numbers and then addresses were appended to the list from an initial 8,400 numbers, a total sample of 4,460 active telephone numbers was obtained. While telephone numbers of low English literacy or non-English speakers were not excluded, all telephone interviews required an English-speaking respondent. No additional exclusion criteria were applied beyond age (18 years and older).

Sample Size and Power

With respect to race/ethnicity, the majority of respondents were Caucasian (n = 541) or African American (70). Thus, the analysis used the 611 respondents that that self-identified into one or the other of these racial/ethnic categories. Power to detect differences between racial/ethnic groups was limited by the relatively small number of African American participants. Power and sample size calculations were conducted in order to determine the Minimal Detectable Effect Sizes (MDESs) for a 2-factor Analysis of Variance (ANOVA) model. Power was set to a conventional 0.80, alpha = two-sided 0.05, and the MDES was determined for main effects and the interaction. Using a 2 X 5 design with 70 African American and 541 Caucasian participants spread equally across levels of the sociodemographic factor, the MDES for the main effect of race/ethnicity was 0.36 SD; for the sociodemographic factor, 0.35 SD; and for the interaction 1.2 SD vs 0.24 SD for the low and high differences between African Americans (AAs) and Caucasians across different levels of the sociodemographic factor.

Data collection was a two-step process involving telephone interviews and follow-up survey mailings. Following Internal Review Board approval, trained interviewers made up to six attempts to contact residents to complete the survey interview by telephone. Individuals who stated they did not wish to complete the survey by phone were given an option of completing the survey either online or in a hard-copy format sent in the mail. A Fleisch-Kincaid evaluation indicated that the survey was at an 8th grade level or below. After one month of telephone calling, paper copies were sent to all non-respondents for whom research staff had a mailing address (n=1,937). The mail packet included the survey as well as information for how to access the survey online for those who wished to complete the survey in that manner. Throughout the mailing period, telephone interviewers continued to call through the sample list. Participants were offered a $5 incentive (in the form of a gift card to local pharmacies) to complete the survey. Data collection ended after four months of telephone interviewing and after a second mailing to non-respondents.

Throughout the process 929 numbers were removed due to known ineligibility (e.g., disconnected number, business number, mailed survey returned by the post office, or unqualified resident); 1,875 numbers had unknown eligibility (busy signal, no answer). The total number of surveys completed was 673. Using the American Association of Public Opinion Researchers' [29] approved response rate calculation process for telephone survey methodology, we included a percentage of the unknown eligibility numbers (64%, the proportion of eligible numbers from the known sample) into the response rate calculation. Thus, a total response rate of 29.8% was obtained.

Measures

The measures obtained in this study included: the standard demographics selected by the Center for Urban Studies (e.g. age, race/ethnicity, marital status, education, income, etc.), the Group-Based Medical Mistrust Scale (GBMMS) (12 Q), health status and health access questions from the Behavior Risk Factor Surveillance System (BRFSS) (3 Q) and health access and utilization questions from the National Health Interview Survey (4Q). The three questions from the Behavioral Risk Factor Surveillance System (BRFSS) focus on current health status and health access issues, specifically level of health coverage and identification of a primary care provider. The BRFSS is the world's largest, on-going telephone health survey system, tracking health conditions and risk behaviors in the United States. The four questions from the National Health Interview Survey (NHIS) focused on identifying access to usual sources of healthcare, the location for the usual source of care, and the number of times healthcare had been accessed in the last year. NHIS data are collected through household interviews. Survey results have been used to provide data on health status, health care access, and progress toward achieving national health care objectives.

Group-Based Medical Mistrust Scale

The GBMMS [1], the most commonly used scale to measure mistrust, [9], is a 12-item, 5–point scale (1 = strongly disagree; 5 = strongly agree) that measures overall mistrust of mainstream health care providers and systems, as well as assessing perceptions of treatment provided to persons of the respondent's self-identified "Group". The GBMMS contains three subscales: suspicion; provider support; and disparities and discrimination in healthcare. The suspicion measures respondents' general lack of trust in the health care system and customary practices. The Group disparities scale addresses respondent beliefs that there are inequalities in the treatment that people from their group receive in the health care setting. The provider support subscale measures the extent to which respondents believe that health care providers' intentions and actions could be insensitive or even harmful to people of the respondent's group. Higher scores indicate more mistrust. Internal consistency for the GBMMS and its subscales is moderate to high (0.61-.87) [27]. Construct validity [27] and convergent validity [24] have been developed with an African American and Latino sample [1]. Convergent validity was tested between the total scale and an acculturation scale. [1] and a vaccine safety scale [24].

Data Analysis

Using IBM SPSS Statistics V25, descriptive statistics (frequencies, mean, standard deviation) were obtained to describe the sample demographics and level of medical mistrust. Independent t –tests, chi square, and Mann Whitney U were done to assess racial differences in demographic data. Analysis of variance (ANOVA) was conducted to examine the association of sociodemographic variables with mistrust, and also to examine if race (African American vs. Caucasian) moderated the relationship between sociodemographic variables and mistrust. All but one analysis used a two-factor ANOVA design in which dichotomously coded race was one factor and the sociodemographic variable was the other factor. This design yields tests of the main effect of each factor and the race x sociodemographic variable interaction. A significant interaction indicates that the effects of race depend on the level of the sociodemographic variable. Due to the limited income data, we conducted an ancillary analysis of income data by race using moderated multiple linear regression analysis. The regression analysis was done to determine if there were significant differences in slope between Caucasians and African Americans in relation to income data.

Results

Sample Characteristics

While a total of 673 residents were surveyed, 611 or 90.8% of the respondents were either Caucasian (80.4%; n = 541) or African American (10.4%; n = 70), 5.1% (n=34) had missing data,

and other racial/ethnic groups each comprised less than 2% (n's of 2 to 13) of the sample. The racial composition of the sample was fairly consistent with the overall demographic profile for the state of Michigan, but with a slightly lower percentage of African Americans in the sample than the state [30]. Data reported in the current paper focuses on mistrust among African American and Caucasian respondents and thus is based on the analytic sample for those 611 participants.

Characteristics of the analytic sample are reported in (Table

1). Of the 611 respondents, the majority were middle-aged (M = 56.2, SD= 17.05; Mdn = 57 years), Caucasian (88.5%), female (66.3%; n=405), high school graduates (94.3%; n=577) who did not report their annual income (52.3%; n=319) but did report having health insurance (90.8%; n=555). African American respondents were significantly younger in age (t $_{(600)}$ = 4.62, p <.001) and reported significantly lower income than Caucasian participants (Mann Whitney U = 2266, p = .002¬). There were no significant racial differences in education or gender of participants.

Characteristic	Total	Caucasian	African American
Race	100% (N = 611)	88.5% (n = 541)	11.5% (n = 70)
Gender			
Female	66.3% (n = 405)	65.4% (n = 354)	72.9% (n = 51)
Male	33.2% (n = 203)	34.2% (n = 185)	25.7% (n = 18)
Missing	0.5% (n = 3)	0.4% (n = 2)	1.4% (n = 1)
Age*			
Range	18 - 95 years	18 - 95 years	19 - 84 years
Mean (SD)	56.21 (+ 17.05) yrs.	57.34 (+16.88) yrs.	47.43 (+15.66) yrs.
Median	57 years	58 years	45 years
Education			
< High School	5.6% (n = 34)	5.5% (n = 30)	5.7% (n = 4)
High School Graduate	34.0% (n = 208)	34.6% (n = 187)	30.0% (n = 21)
Some College	25.5% (n = 156)	22.8% (n = 129)	38.6% (n = 27)
College Graduate	18.2% (n = 111)	18.7% (n = 101)	14.3% (n = 10)
Graduate Education	14.4% (n = 88)	14.8% (n = 80)	11.4% (n = 8)
Missing	2.3% (n = 14)	2.6% (n = 14)	0% (n = 0)
Annual Income*			
< $10,000	1.1% (n = 7)	0.7% (n = 4)	4.3% (n = 3)
$10,000 – $24,999	6.7% (n = 41)	6.1% (n = 33)	11.4% (n = 8)
$25,000 - $49,999	14.1% (n = 86)	14.2% (n = 77)	12.9% (n = 9)
$50,000 – $74,999	9.5% (n = 58)	10.5% (n = 57)	1.4% (n = 1)
$75,000 - $99,999	7.5% (n = 46)	7.9% (n = 43)	4.3% (n =3)
$100,000- $149,999	4.9% (n =30)	5.2% (n =28)	2.9% (n = 2)
>$150,000	3.5% (n = 21)	3.7% (n = 20)	1.4% (n = 1)
Missing/Refused	52.3% (n = 322)	51.6% (n = 279)	61.4% (n = 43)
Health Insurance†			
Yes	90.8% (n = 555)	91.5% (n = 495)	85.7% (n = 61)
No	8.7% (n = 53)	7.9% (n = 43)	14.3% (n = 10)
Missing	0.5% (n = 3)	0.6% (n = 3)	0% (n = 0)
* = significant (p <.05) racial difference; † = difference trending to significance (p <.10)			

Table 1: Participant Characteristics (N = 611).

Health Care Factors

Given that mistrust in health care may be affected by access and health care usage, we examined health care information variables. The vast majority of respondents (90.8%) had health insurance and

82.3% were able to identify a person they considered to be their personal health care provider. Only 57 respondents (9.3%) reported no personal provider. Health care was most often sought in a clinic or doctor's office (92.3%), but 22 (3.6%) respondents indicated

they sought care most often either in a hospital emergency room or outpatient center. Respondents without any health insurance coverage were significantly more likely to report having no personal provider ($X^2_{(1)} = 20.25$, p = <.001), having no usual place for care (z =3.4), and more likely to use an emergency room for health care (z = 2.9) than persons with health insurance. The majority (77.2%) of respondents reported their health as good to excellent (Table 2). Self-rated health was not significantly associated with health insurance status. However, African American respondents reported significantly lower self-rated health (Mann Whitney U =14.807, z = 3.01, p =.003), and were nearly twice as likely to be uninsured as Caucasian respondents, but this difference was not statistically significant ($X^2_{(1)} = 3.08$, p = .08).

GBMMS Scales: Total and Subscales	Caucasian	African American
GBMMS Total Score		
Scale Mean (SD)	1.76 (+ 0.69)	1.68 (+ 0.66)	2.35 (+ 0.71)
Cohen's d	0.978	
t-test	$T_{(609)} = 7.881^{***}$	
Suspicion subscale		
Mean (SD)	1.55 (+ .75)	1.50 (+ .72)	1.98 (+ .82)
Cohen's d	0.623	
t-test	$T_{(609)} = 4.688^{***}$	
Disparities subscale		
Mean (SD)	2.10 (+ 1.10)	1.99 (+ 1.05)	2.91 (+ 1.20)
Cohen's d	0.818	
t-test	$t_{(609)} = 6.113^{***}$	
Provider support subscale		
Mean (SD)	1.83 (+ .80)	1.74 (+ .75)	2.51 (+ .83)
Cohen's d	0.975	
t-test	$T_{(609)} = 8.027^{***}$	

NOTE: *** = significant (p <.001) racial difference; GBMMS = Global Medical Mistrust Scale; SD = Standard deviation

Table 2: Group Based Medical Mistrust (GBMMS) Scale Information (N = 611).

Sociodemographics and Medical Mistrust

The mean level of overall Medical Mistrust (GBMMS total) was 1.76 (SD = 0.69), with mean subscale scores ranging from 1.55 to 2.10. Table 2 provides a more detailed summary of the results by race. As expected, significant racial differences were noted in the mistrust scores. African Americans had a higher GBMMS total score ($t_{(609)}$ = 7.88, p <.001), as well as reporting higher suspicion ($t_{(609)}$ = 4.69, p <.001); group disparities ($t_{(609)}$ = 6.11, p <.001), and believed their ethnic group received less provider support ($t_{(609)}$ = 8.08, p <.001) than Caucasian participants. There were large to very large effect sizes noted for these differences (Table 2). In addition, there were important interactions of race with a number of sociodemographic variables that need to be considered when examining overall mistrust, as well as when examining the individual mistrust subscales (i.e., suspicion, disparities, and provider support). These effects are described below.

Age

We found no main effect of age for the total GBMMS or any of the subscales. There was a significant age X race interaction in the level of total mistrust reported ($F_{(3,594)}$ = 3.272, p = .021) (Figure 1-A). Among the subscales, only the suspicion subscale demonstrated a significant age X race interaction ($F_{(3,594)}$ = 3.980, p = .008) (Figure 1-B). Middle aged African Americans (31-50 age group) had higher GBMMS total and suspicion scores as compared to African Americans and Caucasians in other age groups. Despite these interactions, total GBMMS and suspicion were higher in African American relative to Caucasians across the adult life span.

Gender

There was no significant main effect of gender on total GBMMS, but there was a main effect of gender trending to significance on the disparity's subscale ($F_{(1, 604)}$ = 3.579, p = .059) (Figure 1-C). An interaction effect of gender X race. trending to significance ($F_{(1, 604)}$ = 3.067, p = .080), was noted for total GBMMS also. Findings indicate that among Caucasians, the level of total mistrust was similar for men and women. However, among African Americans, women had a much higher level of total mistrust than African American men, as well as higher than Caucasian men or women (Figure 1-C).

Education

There were no main effects of education for the total GBMMS scale, or for the disparities and provider support subscales, but higher education was associated with less suspicion ($F_{(4, 587)}$ = 2.798, p = .025) (Figure 1-D). For both African American and Caucasian respondents, persons with less than a high school education had the highest level of suspicion. There were no significant education X race interaction effects for the total scale or any subscale. It is interesting to note, that although the education X race interaction

was not significant, Caucasians with less than a high school education reported levels of suspicion in the same range as African Americans with any level of education (Figure 1-D).

Self-Rated Health

There was no significant main effect for self-rated health on the total GBMM scale or any subscale. There was a self-rated health X race interaction that was trending to significance for the total GBMM scale ($F_{(4, 597)}$ = 2.333, p = .055) (Figure 1-E) and also

for the suspicion subscale ($F_{(4, 597)}$ = 2.337, p = .054) (Figure 1-F). There was a strong, nearly linear, inverse relationship between self-reported health and total GBMMS for Caucasian respondents (Figures 1-E, F). In that group, mistrust was highest when self-reported health was lowest. African American respondents reported high levels of mistrust regardless of self-reported health. Among African Americans those with the poorest level of health reported the lowest levels of overall mistrust (Figure 1-E). The same relationships were found for the suspicion subscale for both racial groups (Figure 1-F).
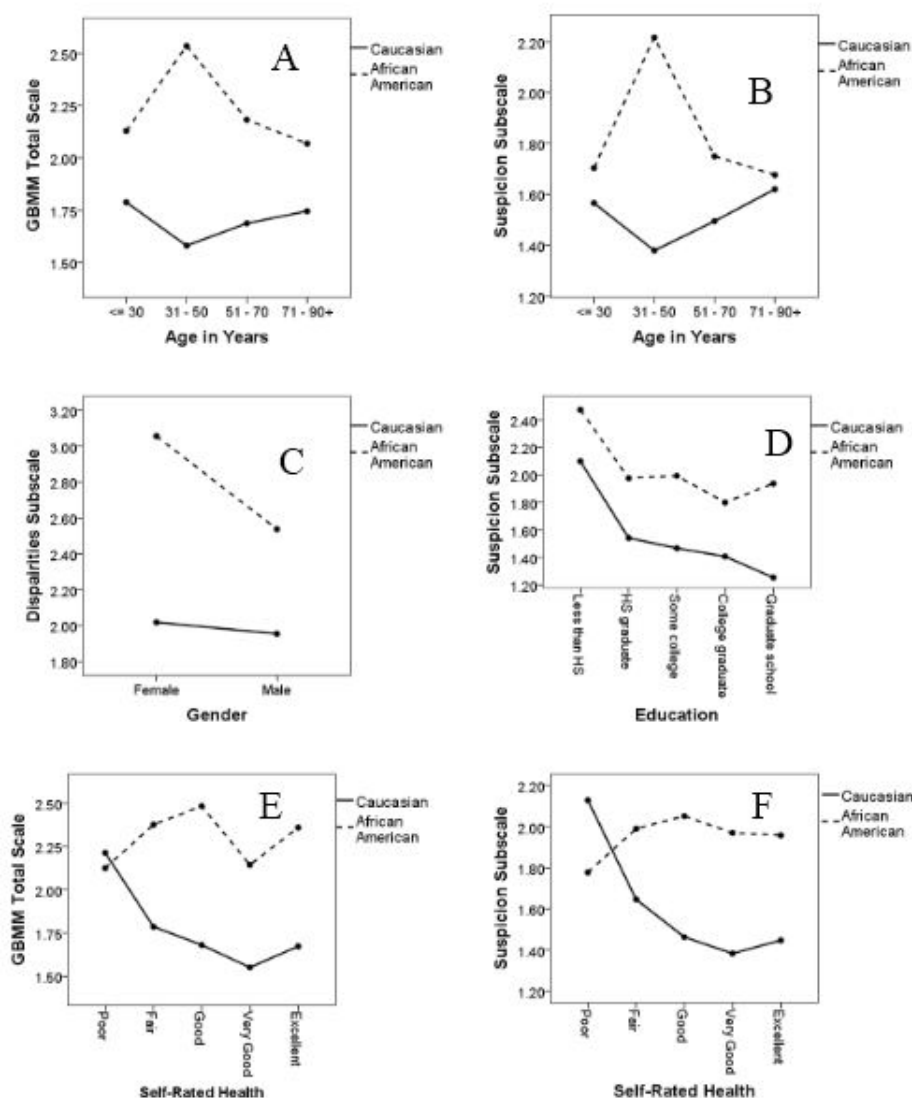

Figure 1 (A-F): Mean levels of Mistrust by Race (African American versus Caucasian) and Various Socio-Demographic Variables: Age (A and B), Gender (C), Education (D) and Self-Rated Health (E and F).

Income

Of the 611 interviewees, less than half provided income data (42.8%, n = 262 of Caucasians; 38.6%, n = 27 of African Americans). For the total GBMM scale, the main effect of income was trending to significance ($F_{(9, 5.706)}$ = 1.864, p = .057), and there was a significant income X race interaction ($F_{(8, 5.493)}$ = 2.019, p = .044). Regression analysis demonstrated that there was a significant linear decline in suspicion as a function of income. As income increased suspicion decreased (β = -.044, t = 2.45, p = .015). The slopes were negative for the total GBMM scale and the disparities and provider support subscales also; however, the regression analyses for those scales were not significant.

Health Insurance and Personal Provider

There were no significant main effects for either health insurance or having a primary care provider on the level of overall mistrust or on any of the subscales. Similarly, there were no significant interaction effects involving race for either of these demographic variables for any aspect of mistrust.

Discussion

Findings from the current study make important contributions to the literature on mistrust. This study is unique in that it examined the concept of medical mistrust in a randomly selected, statewide sample. Inclusion of a large, mostly Caucasian and African American, sample allowed us to identify significant joint effects of race with other sociodemographic variables on medical mistrust. Further, our use of a statewide and randomly selected sample allowed for a normal sample distribution providing a new contribution to the literature. Most of the previous research studies have used age-condensed samples from clinic and disease-specific samples [17,22,31].

Race and Mistrust

Race had a clear main effect on mistrust with African American's having significantly higher global and subscale distrust scores than Caucasian participants. Logically, awareness of and exposure to medical malice (e.g. Tuskegee Study of Untreated Syphilis [TSUS]) and discrimination in healthcare leads to medical mistrust [7,8]. For African Americans, medical malice has been traced from southern slave plantations to more modern-day healthcare environments including, but not limited to the TSUS. These experiences of malice and discrimination have created a deep suspicion about the motivations of the United States health care system. In addition, repeated exposure and generational stories of maltreatment enhance mistrust over time. Previous studies have found that many African Americans report personally experiencing discrimination in health care [26,32,33], while other studies found that stories of medical mistreatment are shared among African American family and friends contributing to generalized mistrust [33]. In addition, previous experiences of racism are inversely associated with trust in individual providers and satisfaction with the care received [7,10]. Thus, these personal and collective experiences combine to increase medical mistrust among many African Americans.

Our finding that African American women had a much higher level of overall mistrust and group disparities mistrust than African American men and Caucasians contradicts results from previous studies using the GBMMS [17,18]. However, those samples have been clinic-based. More research is needed with larger and population-based samples of African Americans to substantiate our novel findings. Our results also found an interesting age X race interaction. Similar to Barsevik and Molina and their colleagues [21,22] we found that younger women had higher levels of medical mistrust. We found that younger African Americans (particularly the 31-50-year-old age group), as opposed to older African Americans and Caucasian participants, had a significantly higher suspicion of the health care system. Given that participants were residents of Michigan, the results may be a function of the socio-political or historical events in the state (e.g. urban inequality, deindustrialization) [34]. Individuals in this generation (1964-1984) may have experienced the most dramatic "White Flight", income inequalities and racial segregation leading to overall suspicion of the "System". More population-based studies with a larger sample of African Americans from various states could support our new findings.

Education and Mistrust

Other than race, education was the only sociodemographic variable to show a significant main effect on the total scale of mistrust. These findings are consistent with previous research [4,26,27]. However, most earlier studies were limited to African American samples. This is the first study to report that education and income level have an impact on suspicion of the health care system among lower educated and lower income Caucasian respondents, also. This finding suggests that the suspicion element of the GBMMS may be as equally affected by education and income level as race. A possible explanation is that the lower educated and lower income Caucasian respondents are interpreting the "Dominant Culture" as highly educated and higher income health care providers. These new findings are partially supported by an older study[14]. Those researchers found that in a sample of predominantly Caucasian, HIV-positive women with less than a high school education, the women reported a significant mistrust of the health care system. Our study is the first to suggest that lower income may affect the "Suspicion" aspects of mistrust in Caucasians. Combined, these findings suggest that interventions targeted to reduce mistrust need to be targeted to socio-economically disadvantaged individuals of all racial groups. Therefore, providers caring for lower educated and lower income individuals may need to implement trust-building

communication skills to overcome suspicion of the system in order to diminish underutilization of health care.

Health Care Factors and Mistrust

Self-Rated Health

Another new finding in the current study was that the relationship of self-rated health to mistrust was moderated by race. Only one other study could be found that evaluated the association between self-rated health and medical mistrust but found no statistically significant associations between these variables in a mixed-race sample of women [35]. In the current study, both African American and Caucasian respondents who reported poor/fair health also reported higher levels of mistrust. The complex associations found in our current study is a new addition to the literature and bears some explanation. Among Caucasians, participants who rated their health as poor had the highest level of mistrust, whereas, among African Americans those who rated their health as poor had the lowest level of mistrust.

The results from the Caucasian participants in this study are also consistent with [14] research in which Caucasian HIV-positive women with poorer self-rated health had more mistrust of the system than African American, and Hispanic men and women. For the African American participants in our study, the results contradict the work of Armstrong et al.. [35] Yet, Armstrong and colleagues used a different measure of mistrust [20] which may be measuring a different concept of mistrust than the GBMMS. The LaVeist instrument was designed to measure mistrust of the health system during the early 2000's "Managed Care" movement. Another explanation may be that our study has not uncovered all of the complexities that impact mistrust in the African American population, and our sample size of African Americans was small. Suggesting that more research is needed to explain the disparate findings.

Healthcare Access

It was surprising to find that having a personal provider and health insurance status did not have a significant main or interaction effect on mistrust levels. Multiple researchers [17,19,27] have found that not having recent contact with the health care system and not having a regular provider is associated with greater mistrust. The current study results may be a function of our sample as the vast majority of respondents (90.8%) had health insurance and 82.3% were able to identify a person they considered to be their personal health care provider. Only 57 respondents reported no personal provider and only 53 respondents did not have health insurance.

Subscale Analysis

In reviewing the results from the current study, it is important to note that the subscales performed differently in relation to the sociodemographic variables. Significant findings were predominantly associated with the suspicion subscale, with the disparity's subscale trending to significance only for gender differences. Other than race, none of the sociodemographic variables were found to be significantly associated with the provider support subscale. Our findings are consistent with recent research suggesting that the suspicion subscale may be the most relevant factor in mistrust [4,8]. Valera and colleagues [8] found a two-factor model (e.g. suspicion and discrimination) during their confirmatory factor analysis of the GBMMS, with the suspicion concept making up the majority of the model and good model fit. Despite these recent findings, much of the research has focused on presenting information about overall mistrust without carefully analyzing which aspects of mistrust are most relevant to the sociodemographic variables under discussion. Future research should assess the different aspects of mistrust to provide an accurate association between factors of mistrust and demographics. Each factor may also warrant different interventions.

Limitations

A few limitations deserve discussion. First, while our response rate is within the acceptable median rate for random-digit dialing surveys using a landline only methodology [36] and respondents were fairly representative of the state statistics [29], our study might have benefitted from oversampling African American participants. Unfortunately, since our study questions were being added to a larger survey, changes to the sampling methodology were not possible. The African American subgroup was small (n = 70) and may have resulted in sampling error and a potential bias to our results. Similarly, the study might have benefitted from a detailed tracking of response rates by recruitment stage and racial-ethnic background [37] including landline telephone number changes. Future researchers are advised to oversample and conduct detailed tracking of response rates when seeking to ensure adequate sampling of persons of color. Another limitation was that insufficient income data was collected. Over half of the respondents (52.3%) refused to provide income data during the survey process. The lack of income data limited our ability to understand the impact of this variable on mistrust.

Finally, there may be issues with using the GBMMS to assess medical mistrust among Caucasians. While the GBMMS has been tested with Caucasians and found to have good reliability [1], the scale questions ask about people in your "Group". We have no way of knowing which "Group" Caucasian respondents used as their reference point. It is unclear if they defined their group based on skin color, ethnic heritage (e.g., Polish, English), or by education/income level. These definitions may have important ramifications for understanding Caucasian mistrust of the health care system. It may also suggest that not all aspects of mistrust measured

with the GBMMS are relevant to Caucasians, which could then affect their overall mistrust scores. Thus, careful examination by subscale factors is warranted in a larger mixed-race sample. The use of a more neutral measure of medical mistrust, such as the Medical Mistrust Index [15] or the Health Care Distrust scale [35] could also be used in the future. Despite these limitations, the study provides important new information about the complex relationships between sociodemographic data and medical mistrust in a community, rather than in a clinic-based, disease-specific sample.

Conclusion

Medical mistrust is an important contributor to non-adherence to care and ultimately racial and socioeconomic disparities in healthcare in the U.S. The current study clarified the associations between sociodemographic characteristics and medical mistrust in a statewide randomly selected sample. New and interesting main effects and race-moderated interaction effects were found on the medical mistrust total scale and subscales, specifically the suspicion subscale. The heterogeneity of perspectives of African Americans toward the health care system is advanced by elucidating the impact of age, gender and self-rated health on medical mistrust. As important, the findings suggest that medical mistrust is not limited to racial and ethnic minority populations; Caucasians with a high school education, lower income and lower self-rated health may be equally distrustful of the health care system. Providers working with poor and underserved populations need to consider the multiplicity of views about the health care system.

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