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Examining the complexity and variation of health care system distrust across neighborhoods: Implications for preventive health care[1]

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Abstract

Purpose—Recently, the institutional performance model has been used to explain the increased distrust of health care system by arguing that distrust is a function of individuals' perceptions on the quality of life in neighborhood and social institutions. We examined (1) whether individuals assess two dimensions of distrust consistently, (2) if the multilevel institutional performance model explains the variation of distrust, and (3) how distrust patterns affect preventive health care behaviors.

Methodology—Using data from 9,497 respondents in 914 census tracts (neighborhoods) in Philadelphia, we examined the patterns of how individuals evaluate the competence and values distrust using the Multilevel Latent Class Analysis (MLCA), and then investigated how neighborhood environment factors are associated with distrust patterns. Finally, we used regression to examine the relationships between distrust patterns and preventive health care.

Findings—The MLCA identified four distrust patterns: Believers, Doubters, Competence Skeptics, and Values Skeptics. We found that 55 % of the individuals evaluated competence and values distrust coherently, with Believers reporting low levels and Doubters having high levels of distrust. Competence and Values Skeptics assessed distrust inconsistently. Believers were the least likely to reside in socioeconomically disadvantaged and racially segregated neighborhoods than other patterns. In contrast to Doubters, Believers were more likely to use preventive health care, even after controlling for other socioeconomic factors including insurance coverage.

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Practical implications—Our findings suggest that distrust patterns are function of neighborhood conditions and distrust patterns are associated with preventive health care. This study provides important policy implications for health care and future interventions.

INTRODUCTION

Individuals' trust of the health care system has important implications for individuals as it can influence individuals' perception and utilization of the health care system (Musa, Schulz, Harris, Silverman, & Thomas, 2009). In the last five decades, individuals' trust of the health care system dropped significantly in the United States. According to the Harris Poll, about 73 percent of respondents reported "a great deal of confidence" in the U.S. health care system in 1966; however, only 34 percent of respondents maintained the same level of confidence in 2012 (Harris Interactive Polls, 2012). In the past decade, this low confidence rate remained roughly constant (Harris Interactive Polls, 2012). Such decrease and persistently low rates of individuals' trust of the health care system warrant the need for more public policy efforts to improve individuals' trust in the U.S. health care system. Thus, it is important to systematically investigate the multiple factors influencing individuals' trust of the health care system.

To understand individuals' perception of the health care system, the distrust of the health care system (hereafter, "distrust") —rather than trust— provides more information because the conceptualization of distrust includes the belief that the trustee will act against the individual's interest (Armstrong et al., 2008; Hall, Dugan, Zheng, & Mishra, 2001; Shoff & Yang, 2012). Distrust is a belief status with a greater possibility of negative consequences than "no trust" (Shoff & Yang, 2012). Negative belief creates adverse impacts on an individual's health behaviors and outcomes, like the use of preventive health services (Musa et al., 2009; Yang, Matthews, & Hillemeier, 2011) and self-rated health (Armstrong et al., 2006; Yang, Matthews, & Shoff, 2011). Furthermore, it can be a barrier to quality health care processes (LaVeist, Isaac, & Williams, 2009).

Distrust is a concept that comprises multiple dimensions (Hall et al., 2001). Rose and colleagues attempted to construct a single dimension measure of distrust but found that the reliability of their scale was low (Rose, Peters, Shea, & Armstrong, 2004). In 2008, Shea and colleagues (2008) identified two dimensions of distrust —competence and values— and developed a reliable and valid distrust scale. *Competence* refers to the technical skills necessary for successful health care, whereas *values* indicate the ethics a health care system should possess such as respect and integrity. In another study, scholars discussed the individual-level determinants of competence and value distrust separately (Armstrong et al., 2008). For example, values distrust varied significantly across various individual demographic and socioeconomic features such as race-ethnicity, educational attainment, income, and insurance status. However, the variations in competence distrust across these characteristics were not statistically significant (Armstrong et al., 2008). Though both dimensions were designed to capture the concept of distrust, little is known about how individuals assess these dimensions together. Understanding such assessment process is critical as there are potential implications of the inconsistent assessment for the use of preventive health care service along these two dimensions.

Among the plausible explanations for the formation of distrust of the health care system in the United States (Norris, 2007), this study focuses on the institutional performance model. Blendon (2007) explained the institutional performance model with a detailed discussion of the increasing distrust of a range of social institutions in the United States including the federal government, churches, banking, and airlines. He argued that the soaring distrust of these social institutions parallels the general increase in the distrust of the health care system. Specifically, the institutional performance model implies that the poor performances of social institutions contribute to the process of shaping distrust, as individuals' distrust may not be directly relevant to personal experience with the health care system. That is, distrust is not solely a consequence of actual health care system performance and individuals' experience, but also a product of the perceptions of other social institutions or environment (Blendon, 2007; Norris, 2007). Recently, researchers have started to use the institutional performance model to explain racial differences in distrust (Shoff & Yang, 2012) and to investigate the interaction effect between distrust and neighborhood social environment on self-rated health (Yang, Matthews, & Shoff, 2011). These studies found that the institutional performance model is an adequate framework to explain individuals' distrust by demonstrating that distrust is a function of individuals' perceptions on the quality of life in neighborhood and social institutions. Despite the important findings guided by this model, we argue that previous studies have adopted this model without critically examining its validity. Furthermore, we argue that it is important to examine the validity of the model and if institutional performance model explains the variations in distrust of the health care system.

The goal of this study is to fill the gaps mentioned above by answering three related questions. First, how do individuals assess two dimensions of distrust together? Specifically, does an individual's competence distrust correspond to values distrust? Previous research has not extensively discussed whether both distrust dimensions of distrust are related to each other. Should an individual assess competence and values distrust coherently, one would observe that high (or low) competence distrust is always accompanied with high (or low) values distrust. Second, does the institutional performance model explain the variations in distrust patterns? Moving beyond the institutional performance model that predominantly focused on individual-level factors, we extend the scope to include neighborhood-level factors because individuals' high levels of competence and values distrust may be the consequences of the perceptions of their neighborhood environment in which individuals and social institutions are embedded. Should this perspective stand, those living in a neighborhood with poor living conditions would have higher competence and values distrust than their counterparts in a better-off community. Finally, what are the potential implications of different assessment patterns of distrust — from the second part of the paper — for the use of preventive health care service? The previous g literature suggested that overall high levels of distrust discourage the use of preventive health care (Musa et al., 2009; Yang, Matthews, & Hillemeier, 2011); however, it remains underexplored whether different assessment patterns alter the relationship between distrust and the use of preventive health care service. We have three hypotheses: (H1) Most individuals evaluate competence and values distrust in a coherent fashion, while others may report high level in incoherent fashion (e.g., high level in one dimension but low level in another), (H2) when considering

neighborhood-level factors such as racial composition, living condition, and socioeconomic status (SES), individuals with high levels of competence and values distrust are more likely to reside in socioeconomically disadvantaged (i.e., poor housing condition and low SES) and racially segregated neighborhoods (i.e., high concentration of minority) than other patterns, and (H3) individuals who consistently report high competence and values distrust are the least likely to use preventive health care service, whereas those who persistently report low competence and values distrust are the most likely to engage in preventive health care activities.

METHODS

Data sources and measures

To test our hypotheses, we draw from two data sources to construct both individual- and neighborhood-level factors. The individual-level data comes from the Philadelphia Health Management Corporation's (PHMC) 2008 Household Health Survey. The PHMC survey covered five counties in southeastern Pennsylvania (Bucks, Chester, Delaware, Montgomery, and Philadelphia counties) and used both stratified sampling and the random-digit dialing methodology to conduct interviews (PHMC, 2008). The validity of this data set was discussed in previous research (Matthews & Yang, 2010; Shoff & Yang, 2012). There were 9,497 adult respondents in this study. They were asked to answer how much they agree or disagree with the following six statements: (1) the health care system makes patients' health better, (2) patients receive high quality care from the health care system, (3) the health care system gives excellent medical care, (4) patients get the same medical treatment regardless of race, (5) the health care system puts making money above patients' needs, and (6) the health care system lies to make money. These questions were rated on a 5-level Likert scale ("strongly disagree", "disagree", "neither agree nor disagree", "agree", and "strongly agree"), and all questions were coded to reflect that high values indicate high distrust. The first four questions were associated to competence distrust and the last two questions were associated with values distrust. The reliability of this scale was 0.795 (Cronbach's Alpha) and the multilevel latent class analysis approach (MLCA, discussed below) used respondents' answers to these questions to understand whether individuals consistently assess the competence and values distrust.

In addition to the distrust scale, the PHMC also collected information on respondents' utilization of preventive health care services. Three screening tests were considered: blood cholesterol, Papanicolaou smear test (Pap test), and prostate cancer screening. More specifically, respondents were asked how long it has been since blood cholesterol has been checked last and the answers range from 1 (less than one year) to 6 (never) where larger values indicating longer time since last blood cholesterol check. Female participants were first asked how long it has been since the last Pap test and the PHMC compared the answers with the cervical cancer screening guidelines —which differ by age groups— to create a dichotomous variable where those who follow the guidelines were coded 1, otherwise 0. Similarly, male respondents reported how long it has been since last prostate cancer screening and the PHMC created a binary variable where those followed the cancer screening guidelines were coded 1, otherwise 0. These three variables served as the

dependent variables in this study. The ordinary least square (OLS) regression was applied to blood cholesterol test and the logistic regression was used for the Pap and prostate cancer tests. The blood cholesterol test measure assessed how both female and male respondents utilize the general preventative health care service, and Pap test and prostate cancer screening assessed how individuals utilize the gender-specific preventative health care services.

Six additional individual characteristics were included in the analysis. *Gender* was coded 1 for females and 0 for males, and this variable was only applied to the blood cholesterol test. An individual's *age* was treated as a continuous variable. *Educational attainment* was categorized into five groups: less than high school (reference), high school graduate, some college education, college graduate, and post-college degree. Three *race/ethnicity* groups were identified: non-Hispanic white, non-Hispanic black, and others. As the Philadelphia metropolitan area had relatively small Hispanic population, we combined Hispanics with other racial/ethnicity groups. With respect to one's socioeconomic status, a respondent was determined to be impoverished based on the Federal poverty line. The *poverty* variable is coded as 1, otherwise 0. Individuals who had any health insurance coverages were coded 1 and those without any insurance were coded 0.

Beyond the individual-level covariates, we included neighborhood-level factors to examine the institutional performance model. Neighborhood-level factors were operationalized at the Census tract level, which is a common approach in health research (Wight et al., Forthcoming). We draw our neighborhood-level data from the American Community Survey (ACS) 2006–2010 five-year estimates (US Census Burean, 2011). The 9,497 respondents resided in 914 neighborhoods (tracts) in the survey area, and we used three measures of the neighborhood environment. First, *racial composition* comprised of four variables: percent of non-Hispanic White, percent of non-Hispanic black, percent of non-Hispanic other races, and percent of Hispanics. The race/ethnicity was self-reported and the group of non-Hispanic other races included those who reported more than 2 races. Second, *living conditions* were measured with four variables: percent of households with more than one person per room, percent of households without telephone service, percent of households without vehicles, and percent of household without plumbing systems. Third, *SES* included six variables: percent of single-parent households with children, percent of population with at least a high school diploma, unemployment rate, median family income, percent of owner-occupied housing units, and percent of family in poverty. These neighborhood variables were used to profile the neighborhoods where individuals in different distrust evaluation patterns live.

Analytic strategies and methods

Our analytic strategy had three stages. The first stage was to identify the patterns of assessing competence and values distrust questions with MLCA, and to label the patterns based on the results. The second stage was to compare the neighborhood variables across different distrust patterns and test if individuals in different evaluation patterns reside in different neighborhoods. It is important to note that the MLCA specification in the previous stage only included the neighborhood-level random effect and the neighborhood covariates

were not included. This specification aligns recent studies (Henry & Muthén, 2010; Vermunt, 2003) and justifies the second stage of analysis. The third stage was to understand the relationships between the patterns identified by MLCA and the three preventive health care tests with the OLS and logistic regressions. We elaborate on each stage in greater details:

Stage 1—As discussed previously, the respondents in the PHMC survey were linked to their neighborhoods to constitute a hierarchical data set using census tract as a common geographic identifier. We used the Multilevel Latent Class Analysis (MLCA) to identify the number and structure of latent profiles that emerged from this hierarchical data set. The traditional latent class analysis (LCA) approach fails to address the potential dependence among respondents from the same neighborhood (Clogg, 1988; Lazarsfeld & Henry, 1968) and does not fit the hierarchical data structure. Addressing these limitations, the MLCA approach (Henry & Muthén, 2010; Vermunt, 2003) has improved this shortcoming by taking the neighborhood-level random effects into account in recent years. More specifically, the MLCA allows the latent classes not only account for the frequency distribution at neighborhood-level but also individual-level variations.

The MLCA approach improves the traditional LCA approach. The LCA approach provides an important foundation for understanding the MLCA approach. LCA converts continuous variables into dichotomous variables by using a probability-based approach (Lazarsfeld and Henry, 1968).LCA used Expectation-Maximization algorithm to complete the process. The MLCA approach further includes the random errors at the second level (i.e., neighborhood) into the LCA probability-based procedure in order to account for the potential clustering within neighborhoods (Vermunt, 2008). Our MLCA assumed that respondents' latent distrust of health care system was a random variable, which overcame the shortcoming of assuming the probability of the outcome was constant within each neighborhood (Asparouhov & Muthén, 2008; Snijders & Bosker, 2001). For example, our MLCA model included six indicators which can be written as follows. The conditional probability of P given a latent class for each respondent in each neighborhood is:

$$P=(U_{ij1}=s_1, U_{ij2}=s_2 \ldots U_{ijk}=s_k)=\sum_{w=1}^{W} P(C_{ij}=w)\prod_{k=1}^{K} P(U_{ijk}=S_K|C_{ij}=w)$$

U_{ijk} represent the distrust of individual *i* in the neighborhood *j* on the indicator *k* and s_1 represents the specific response for the first indicator. C_{ij} refers the latent class membership and the total number of latent classes are referring as *W*. The probability of specific respondent pattern, such as P {k_1=1, k_2=1, k_3=1, k_4=1, k_5=0, k_6=0}, is the weighted average of the probabilities conditional on class membership (Henry &Muthén. 2010).

To fully utilize the data structure of the unique hierarchical data constructed from the PHMC and ACS, this study employed the MLCA approach to identify potential patterns of how individuals rated competence and values distrust, and the variations of distrust typology among neighborhoods. For example, some individuals may experience similar competence and values distrust patterns, but the probability and the mean level of distrust patterns that

these individuals belong to a certain latent class may be more concentrated in neighborhoods with certain characteristics. The features of MLCA with random coefficient allow more flexibility to assess the institutional performance model and the impacts of neighborhood on distrust patterns.

Stage 2—Using the MLCA results, we employed neighborhood-level analysis by comparing the mean values of the neighborhoods across different latent classes. The main analytic approach included the analysis of variance and post-hoc pairwise comparisons, consistent with previous studies (Montgomery, 2008). These analyses aim to examine whether there are any significant differences in neighborhood environments across latent classes and if yes, to investigate whether the difference support the institutional performance model as discussed previously.

Stage 3—The OLS and logistic regressions were used to understand if the latent classes have different implications for the use of preventive health care service even after accounting for other individual sociodemographic characteristics. We opt not to discuss the details of these methods due to their popularity in research but they are available upon request.

Figure 1 summarized the analytic stages. To reiterate, we first used MLCA to identify the underlying distrust patterns and then examined whether the neighborhood conditions varied significantly across different patterns. The last stage is to include the distrust patterns and other covariates to understand if the distrust patterns have implications for preventive health care utilization, namely blood cholesterol test, Pap test, and prostate cancer screening.

RESULTS

Our MLCA suggests that there are four distrust patterns (latent classes) of responses to the six distrust questions; the results are summarized in Table 1. We added each subsequent model to include an additional profile until the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR) was non-significant indicating that additional profile did not improve model fit. We then evaluated model fit by examining Akaike's information criterion (AIC), Baysian information criterion (BIC), the adjusted Baysian information criterion (ABIC), and entropy. Our model fit statistics —especially the Bayesian Information Criterion (BIC) and entropy— strongly suggested the four-class typology fit the data best. Explicitly, the entropy value was the highest (0.896) in the four-class analysis, compared to the two-, three-, and five-class analyses (see Table 1).

The MLCA identified four distrust patterns: Believers, Doubters, Competence Skeptics, and Values Skeptics. The first group showed low distrust scores in all six items and thus was labeled as "Believers." Roughly 25 percent of the respondents were classified into this category. The second group of participants reported high scores for all questions and accordingly was named "Doubters," which accounted for about 30 percent of our data. Believers and Doubters rated competence and values distrust coherently meaning if one rated high competence distrust then he or she also rated high values distrust, vice versa. In other words, their evaluation of distrust did not vary across two dimensions of distrust.

However, they only explain 55 percent of individuals' assessments of distrust, and nearly 45 percent of individuals assessed distrust in incoherent manner. The third subtype only included 543 respondents (6%) who had high competence distrust but low values distrust. This type was called "Competence Skeptics." Despite the relative small group size, it represents a qualitatively distinct type of assessing distrust. The last, and the largest, category embraced almost 40 percent of the participants and was labeled as "Values Skeptics." They had high values distrust but low competence distrust. For the last two subtypes, rating competence distrust seemed to be independent of assessing values distrust as they evaluated them incoherently.

Overall, in contrast to competence distrust, the values of the health care system received higher distrust among all participants. That is, almost 70 percent (30% Doubters and 39% Values Skeptics) of the respondents had high values distrust. For example, they suspected that making money is the first priority of the system (see questions (5) and (6) above). On the other hand, respondents in the PHMC survey largely trusted the technical abilities of the health care system to make patients' health better (about 65%). The four subtypes not only confirmed that distrust has both competence and values dimensions, but also have suggested that a significant number of people in fact assess them independently.

After identifying four patterns, we compared and tested whether neighborhood characteristics varied significantly across the patterns. The analytic results of multiple comparison tests are summarized in Table 2. We found statistically significant differences in all neighborhood variables except one (i.e., percent of non-Hispanic other races). The key findings are summarized as follows: First, Doubters and Competence Skeptics seemed to share similar neighborhoods in terms of racial composition in which they reside in neighborhoods with high concentrations of non-Hispanic blacks. On the other hand, Believers lived in neighborhoods dominated by non-Hispanic whites with less concentration of any minority populations. Second, in terms of living conditions, Doubters and Competence Skeptics tended to live in neighborhoods with more households lacking in room space, telephone service, vehicles, and/or plumbing systems compared to Believers. Furthermore, comparing the neighborhoods of Doubters with those of Values Skeptics, the latter seemed to be better off in all four indicators of living conditions. Third, with respect to SES, the neighborhoods where Believers lived had the highest SES compared to any other subtypes. Explicitly, Believers were exposed not only to the lowest percent of single-parent households with children and unemployment rate, but also to the highest levels of educational attainment and family income. However, no significant differences were found in poverty and the percent of owner occupied housing units between the neighborhoods of Believers and those of Value Skeptics. In comparison with Doubters, Values Skeptics' neighborhoods were significantly better in all six SES variables. In other words, Believers were less likely to reside in socioeconomically disadvantaged and racially segregated neighborhoods than other patterns. Fourth, a notable trend in Table 2 was that the neighborhoods of Doubters were not significantly different from those of Competence Skeptics. Fourth, Competence Skeptics and Values Skeptics were found to live in very different neighborhoods. Specifically, the former's exposure to minorities, households in poor living conditions (e.g., no vehicles and/or plumbing systems), and disadvantaged SES (e.g., high poverty and low income) were significantly greater than the latter. However, the

similarity between these two subtypes lied in the percentages of households that were crowded and without telephone service, as well as the percentages of non-Hispanic other races and Hispanics. In summary, neighborhood characteristics of four different patterns of distrust vary significantly.

In the last stage of the analysis, the relationships between the distrust patterns (latent classes) and the use of preventive health care service were examined with series of regression models. We used Doubters as our reference group throughout the analyses in this stage. Table 3 presents the OLS results of the blood cholesterol test and one major finding was observed. The associations between latent classes and the time since last blood cholesterol test were not apparent (see Models 1 and 3) until we took the interactions between insurance coverage and latent classes into account (Models 2 and 4). In Model 2, all other variables being equal, among those respondents who had insurance, Values Skeptics had a slightly shorter time period (−1.14–0.214+0.213= −1.141) since their last blood cholesterol than Doubters (−1.14). This gap increased to 0.214 between uninsured Doubters and uninsured Values Skeptics. Similar patterns could be observed between Competence Skeptics and Doubters, though the differences were marginally significant. Surprisingly, we did not observe any significant time differences for blood cholesterol test between Doubters and Believers.

With respect to whether a female respondent followed the guidelines to have a Pap smear test, the logistic regression results (see Table 4) suggested a clear disadvantage for Doubters. Specifically, in Model 1 of Table 4, *ceteris paribus*, Believers were approximately 20 percent more likely to have a Pap test within a recommended time period than Doubters. Despite a slight decrease, Values Skeptics were about 15 percent more likely to follow the guidelines to have a cervical cancer test than Doubters. Moreover, unlike the findings of blood cholesterol tests, the distrust latent patterns seemed to be independent of insurance coverage but were related to race/ethnicity. Doubters who identified themselves as other race/ethnicity groups had the lowest odds of having a Pap test on time (Model 3). Across the latent patterns, non-Hispanic black respondents consistently had higher odds of receiving a cervical cancer screening test than other race/ethnicity groups.

Though the associations between distrust latent classes and Pap test were more moderated by insurance coverage, whether women had health insurance is a crucial factor for utilizing the regular Pap tests. This relationship remained valid after considering other sociodemographic characteristics such as educational attainment and poverty. More importantly, our findings indicated that as long as the competence distrust was low, respondents were willing to use this specific screening test. That being said, whether an individual believe that health care system is capable of making patients healthy is a key facilitator for cervical cancer screening.

As for male respondents, the associations between distrust latent classes and prostate cancer screening were summarized in Table 5. In contrast to Doubters, Believers were almost 40 percent more likely to have a prostate cancer test during a recommended time period (Model 1 of Table 5). Though the estimated relationships between Values and Competence Skeptics and prostate cancer screening followed the expectations, they were marginally significant

across the four models in Table 5. Several findings were different from those in the blood cholesterol and cervical cancer screening analyses. First, the associations between distrust patterns and prostate cancer screening did not vary across insurance coverage or race/ethnicity. Including these interactions neither improved our model fits nor unveiled any nuanced relationships. Second, race/ethnicity was not a determinant of receiving a prostate cancer screening test, though race/ethnicity contributes to our understanding of why individuals have blood cholesterol and Pap tests.

In addition to the findings about how distrust latent classes were associated with the use of preventive health care services, we observed several patterns shared across Tables 3 to 5. First, an individual's age was associated with the preventive health behaviors but the associations varied by the dependent variables. As age increases, the time between two blood cholesterol tests would be shorter, and older men were more likely to have a prostate cancer screening test than their younger counterparts. However, the odds of having a Pap test actually decreased with the increase in age among women. Second, insurance coverage was a consistent facilitator for the use of preventive health care service and this finding was not altered by including other covariates. This finding became even more critical when we investigated whether and how distrust latent classes affect the use of screening tests. Specifically, even when individuals have the access to health care providers (i.e., being insured), their competence or values distrust would undermine their willingness to use screening tests. Finally, the protective effect of high educational attainment was persistent across models, particularly among those who have at least a bachelor degree. Our finding suggests that it is important to target individuals with certain education background to facilitate greater understanding of the importance of regular screening or preventive health care service.

DISCUSSION

Our paper had three goals. First, we examined the dimensions of distrust by identifying different subgroups (patterns) related to two distrust dimensions – competence and values distrust. Second, we examined how neighborhood characteristics of individuals in different distrust subgroups vary. Third, we assessed the relationships between distrust subgroups and individuals' preventive health care behaviors. The results provide empirical evidence for our hypotheses. We first hypothesized that the most individuals evaluate competence and values distrust in a coherent fashion. The MLCA results appear to partially confirm this hypothesis as only about55 percent of the respondents consistently reported their competence and values distrust (i.e., Doubters and Believers). Values Skeptics — comprising almost 40 percent of the participants— was the largest group, and it suggests that individuals have strong confidence in the ability of the health care system to make their health better, yet they have less confidence in the integrity or honesty of the health care system. This divergent pattern suggests that the etiologies of developing competence and values distrust are different, and future research should investigate on exploring the factors that lead to the divergent patterns of distrust.

We then hypothesized that individuals with high distrust were more likely to reside in economically disadvantaged (measured by poor living conditions and lower SES) and

racially segregated (measured by high concentrations of minorities) neighborhoods. The multiple comparison results provided strong evidence for this hypothesis. As several previous studies have found (Armstrong et al., 2008; Shoff & Yang, 2012), the non-Hispanic black population reported significant higher distrust compared to other race/ethnic groups. Our own findings that Doubters' neighborhoods had the highest percent of non-Hispanic black echoes the literature. Similarly, Doubters, as well as Competence and Values Skeptics, tend to live in socioeconomically disadvantaged neighborhoods indicated by higher rates of crowded housing units and poverty. Distinct from other three patterns, Believers reside in economically better neighborhoods characterized by better living conditions and higher SES and but highly segregated neighborhoods (i.e., lower concentration of minorities). In addition to structural characteristics of neighborhoods we have tested in our study, future studies should investigate different dimensions of neighborhoods. Namely, more scholarly investigations are needed to investigate the social and physical characteristics of neighborhoods. For example, future studies should investigate whether individuals in neighborhood with high collective efficacy (e.g., the combination of trust and cohesion among residents in a neighborhood that allows for social control (Sampson, Raudenbush, & Earls, 1997)) more likely to have lower rates of distrust.

Lastly, we hypothesized that Doubters are the least likely to use preventive health care services, whereas Believers are the most likely to use preventive health care services. Although we have obtained evidence to bolster this hypothesis from the analyses of Pap test and prostate cancer screening, this hypothesis did not hold for the blood cholesterol test. We found that the relationships between distrust latent classes and the use of preventive health care services may differ by the screening test of interest because there are different thresholds for obtaining these services. For example, it is more time consuming and invasive to receive a Pap test compared to blood cholesterol test; thus, individuals' physical and emotional costs related to these two types of test may differ. In addition, as long as individuals reported low competence distrust, individuals may still be more likely to adopt preventive health care services in contrast to those who do not believe that health care systems are able to make patients healthy. Our results are consistent with the previous studies in that individuals who distrust health care system are less likely to engage in preventive health care behaviors (Shoff & Yang, 2012). However, the association between distrust patterns and preventive health care behaviors differ in a meaningful way that distrust was associated with lower engagement in Pap test and prostate cancer screening only. We suspect that different associations between distrust and types of preventive services may be attributable to varying costs and benefits associated with different types of preventive services.

Our findings above convey several important messages to health researchers. Particularly, the institutional performance model implies that an individual's distrust is not only associated with personal experience with the health care system, but also related to the individual's social and residential environments. That is, the changes in the neighborhood social environment would "trickle down" to an individual's assessment of distrust. Since distrust plays a key role in health interventions and research (Corbie-Smith & Ford, 2006; Corbie-Smith, Thomas, & St George, 2002), individual health behaviors (Musa et al., 2009; Yang, Matthews, & Hillemeier, 2011), and self-reported health outcomes (Armstrong et al.,

2006; Cunningham, Sohler, Korin, Gao, & Anastos, 2007; Yang, Matthews, & Shoff, 2011), it is important to reduce the high distrust among Americans to improve population health and promote health research. More importantly, the neighborhood-level characteristics and individual's attitudes are generally more amendable than other individual-level characteristics (e.g., educational attainment, race/ethnicity, and age) (Consedine, Christie, & Neugut, 2009). Our findings provide a plausible approach to target improving the neighborhood conditions for lowering individuals' health care distrust. Policy targeted to improve the neighborhood conditions can potentially influence more people (e.g., all neighborhood residents) than targeting individuals.

Moreover, relatively few people had the competence dimension of health care system distrust, but the high values distrust warrants further attention. Others have argued that modernization and cultural shifts would naturally encourage the development of critical views on authorities (Norris, 2007); however, if this knowledge stream holds, why does the literature, especially in the U.S., suggest that values distrust is higher than competence distrust (Armstrong et al., 2008; Rose et al., 2004; Shoff & Yang, 2012)? One should expect that the difference between competence and values distrust is minimal as these critical views should be applied to both dimensions. A plausible explanation may come from Putnam's social capital argument (Putnam, 2001), which indicates that mutual trust, reciprocity, and civil participation among individuals in a community have collapsed in the past few decades in the U.S. The overall decrease in these social norms, civil involvement, and social trust led to high distrust of various social institutions, especially their values of providing services. Due to data limitations, this study could not test this statement, but future research should further clarify the role of social capital in the formation of distrust. Future research should also investigate whether individual-level and neighborhood-level factors influence competence dimension of distrust and value dimension of distrust similarly. For example, does individuals' positive experience with the health care system reduce the competence distrust but not value distrust? Future studies should have more nuanced investigation of how these two dimensions differ.

There are several limitations to our study. The findings above were drawn from the Census tract level data. Several scholars have noted that using different geographic scales in health research may lead to inconsistent conclusions (Mobley, Kuo, & Andrews, 2008). To address this issue, this study also conducted the multiple comparisons with ZIP code level data as a sensitivity test. The results (not shown but available upon request) supported our previous conclusions, and therefore the findings of this study are fairly robust and reliable. Beyond this sensitivity test, however, several limitations of this study should be noted. First, the causal relationships between distrust and living arrangement are tentative due to use of cross-sectional data. An intervention study like Moving to Opportunity (Leventhal & Brooks-Gunn, 2003) should help researchers to clarify whether high distrust is a consequence of poor perceptions of living environment. Second, researchers and policy makers should be cautious when generalizing the findings to other regions of the United States as the PHMC survey was very specific to the population in the southeastern region of Pennsylvania, rather than a nationally representative dataset. Third, while the distrust scale in this study is the most recently developed with an emphasis on health care system (Armstrong et al., 2008), using a distrust scale with a different focus (e.g., physicians or

health insurance company) may yield different findings. Finally, our examination of the institute performance model mainly depends on the ACS data, which may not fully capture one's perception of the environment.

Despite these limitations, the results from this study have important implications for public policy and suggestions for future research. In sum, this study explicitly examined whether the dual-dimensional distrust fits the institutional performance model with MLCA and multiple comparison tests. While this study does not endeavor to investigate the causes *per se* of the soaring distrust since 1960s, our findings suggested that individuals reporting high distrust tend to be exposed to poor social and living neighborhood environments, which bears implications for future research and policies that aim to facilitate health behaviors and population health. Our finding also suggested that decreasing competence distrust may be a mechanism to encourage the use of preventive health care, though the overall distrust remains high.

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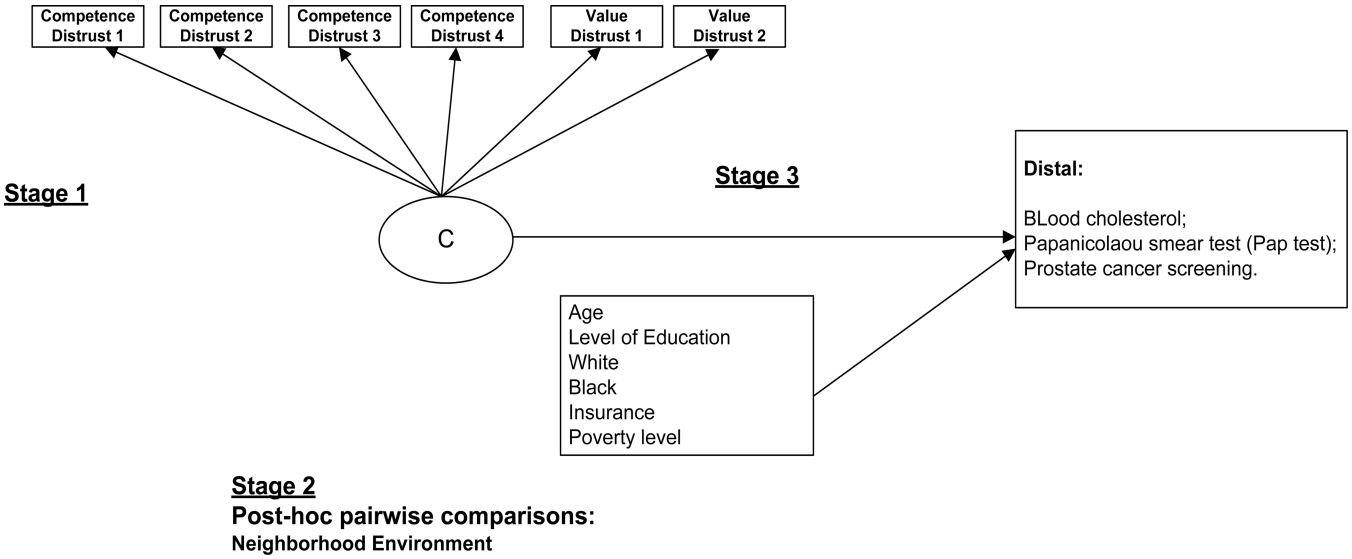

Figure 1.

Summary of the analytic strategy and key variables

Table 1

Results of the multilevel latent class analysis (mean values in cells)[†]

	Believers	Doubters	Competence Skeptics	Values Skeptics
Distrust Q(1): Competence	2.06	3.60	2.94	2.57
Distrust Q(2): Competence	1.90	4.04	3.94	2.20
Distrust Q(3): Competence	2.05	3.66	3.21	2.51
Distrust Q(4): Competence	2.49	3.85	3.35	3.15
Distrust Q(5): Values	2.10	4.40	2.13	4.06
Distrust Q(6): Values	2.21	3.74	2.62	3.17
Total number of respondents	***2374 (25%)***	***2873 (30%)***	***543 (6%)***	***3707 (39%)***
Bayesian Information Criterion (BIC) = 162.022; Entropy=0.896				

[†]The entropy values for 2, 3 and 5 groups are 0.826, 0.826, and 0.874, respectively. Similarly, the BICs are 167.895, 164.716, and 167.595.

Table 2

Descriptive Statistics and Group Significance Comparisons (mean values in cells)

Neighborhood Variables	Overall sample	Believers	Doubters	Competence Skeptics	Values Skeptics	Comparisons†
Racial Composition						
Percent of non-Hispanic white	63.18	69.29	56.34	59.35	65.06	a,b,c,e,f
Percent of non-Hispanic black	24.70	19.04	30.87	28.48	23.07	a,b,c,e,f
Percent of non-Hispanic other races	5.95	5.88	6.04	5.72	5.95	
Percent of Hispanics	5.90	5.58	6.43	6.45	5.63	a,e
Living Conditions						
Percent of households with more than 1 person per room	1.48	1.25	1.77	1.59	1.39	a,b,e
Percent of households without telephone service	3.48	3.05	3.98	3.77	3.33	a,b,c,e
Percent of households without vehicles	17.12	14.68	20.32	19.65	15.86	a,b,e,f
Percent of household without plumbing system	1.76	1.46	2.15	2.25	1.59	a,b,e,f
SES						
Percent of single-parent households with children	12.40	10.81	14.19	13.85	11.83	a,b,c,e,f
Percent of population with at least a high school diploma	86.13	87.60	84.37	84.97	86.70	a,b,c,e,f
Unemployment rate	5.19	4.68	5.81	5.54	5.01	a,b,c,e,f
Median family income	76010.32	83511.25	68344.34	72116.30	77623.24	a,b,c,e,f
Percent of owner occupied housing units	68.91	70.96	66.19	67.48	69.87	a,b,e
Percent of family below poverty line	20.65	17.92	23.93	23.46	19.49	a,b,c,e,f

† a: Believers and doubters are significantly different; b: Believers and competence skeptics are significantly different;
c: Believers and values skeptics are significantly different; d: Doubters and competence skeptics are significantly different;
e: Doubters and values skeptics are significantly different; f: Competence skeptics and values skeptics are significantly different ($p<0.05$).

Table 3

OLS Regression Results of Blood Cholesterol Test (All Respondents).

	Model-1		Model-2		Model-3		Model-4	
Variables	**Estimates**	**S.E.**	**Estimates**	**S.E.**	**Estimates**	**S.E.**	**Estimates**	**S.E.**
Distrust Latent Class (ref=Doubters)								
Believers	0.006	(0.032)	0.024	(0.139)	−0.013	(0.036)	0.000	(0.142)
Competence skeptics	−0.044	(0.053)	−0.366^{+}	(0.200)	−0.045	(0.063)	−0.373^{+}	(0.203)
Values skeptics	−0.016	(0.028)	−0.214*	(0.106)	−0.047	(0.033)	−0.262*	(0.109)
Demographics								
Gender (female=1)	−0.046^{+}	(0.025)	−0.045^{+}	(0.025)	−0.047^{+}	(0.025)	−0.047^{+}	(0.025)
Age	−0.219***	(0.009)	−0.220***	(0.009)	−0.220***	(0.009)	−0.220***	(0.009)
Educational Attainment								
High School Graduate	−0.027	(0.049)	−0.028	(0.049)	−0.027	(0.049)	−0.027	(0.049)
Some College Education	−0.068	(0.053)	−0.069	(0.053)	−0.066	(0.053)	−0.067	(0.053)
College Graduate	−0.100^{+}	(0.053)	−0.101^{+}	(0.053)	−0.098^{+}	(0.053)	−0.099^{+}	(0.053)
Post-college Degree	−0.141*	(0.056)	−0.143*	(0.056)	−0.140*	(0.056)	−0.142*	(0.056)
Race/Ethnicity (ref=Others)								
Non-Hispanic White	0.045	(0.041)	0.045	(0.041)	0.046	(0.041)	0.046	(0.041)
Non-Hispanic Black	−0.233***	(0.045)	−0.234***	(0.045)	−0.287***	(0.057)	−0.291***	(0.057)
Socioeconomic Status								
Insurance Coverage (yes=1)	−1.045***	(0.050)	−1.140***	(0.075)	−1.044***	(0.050)	−1.145***	(0.075)
Poverty Status (poor=1)	0.007	(0.014)	0.007	(0.014)	0.007	(0.014)	0.007	(0.014)
Interaction Terms								
Insurance*Believers			−0.014	(0.143)			−0.008	(0.143)
Insurance*Competence Skeptics			0.348^{+}	(0.207)			0.352^{+}	(0.208)
Insurance*Values Skeptics			0.213^{+}	(0.110)			0.229*	(0.111)
Black* Believers					0.065	(0.076)	0.062	(0.077)
Black* Competence Skeptics					−0.003	(0.118)	0.002	(0.118)
Black* Values Skeptics					0.116^{+}	(0.064)	0.126^{+}	(0.065)

	Model-1		Model-2		Model-3		Model-4	
Variables	**Estimates**	**S.E.**	**Estimates**	**S.E.**	**Estimates**	**S.E.**	**Estimates**	**S.E.**
Constant	3.240***	(0.077)	3.329***	(0.094)	3.257***	(0.078)	3.353***	(0.095)
R-squared	0.113		0.114		0.114		0.114	

*** p<0.001,

** p<0.01,

* p<0.05,

+ p<0.10

Table 4

Logistic Regression Results of Pap Smear Test (Female Respondents, 1=following guidelines to have a Pap smear test).

	Model-1		Model-2		Model-3		Model-4	
Variables	**Odds Ratio**	**C.I.**	**Odds Ratio**	**C.I.**	**Odds Ratio**	**C.I.**	**Odds Ratio**	**C.I.**
Distrust Latent Class (ref=Doubters)								
Believers	1.219*	(1.026 – 1.450)	1.688	(0.849 – 3.356)	1.311**	(1.083 – 1.589)	1.913+	(0.944 – 3.878)
Competence skeptics	1.052	(0.787 – 1.407)	1.401	(0.530 – 3.701)	1.382+	(0.979 – 1.951)	2.095	(0.773 – 5.682)
Values skeptics	1.163*	(1.001 – 1.352)	1.101	(0.671 – 1.806)	1.286**	(1.087 – 1.522)	1.305	(0.779 – 2.184)
Demographics								
Age	0.624***	(0.591 – 0.658)	0.624***	(0.591 – 0.658)	0.622***	(0.590 – 0.657)	0.623***	(0.590 – 0.657)
Educational Attainment								
High School Graduate	1.151	(0.905 – 1.464)	1.154	(0.907 – 1.467)	1.143	(0.899 – 1.454)	1.145	(0.900 – 1.457)
Some College Education	1.325*	(1.019 – 1.725)	1.331*	(1.023 – 1.732)	1.298+	(0.996 – 1.690)	1.303*	(1.000 – 1.696)
College Graduate	1.889***	(1.431 – 2.493)	1.900***	(1.439 – 2.507)	1.866***	(1.413 – 2.464)	1.877***	(1.421 – 2.479)
Post-college Degree	2.134***	(1.577 – 2.888)	2.142***	(1.582 – 2.899)	2.093***	(1.545 – 2.834)	2.101***	(1.551 – 2.845)
Race/Ethnicity (ref=Others)								
Non-Hispanic White	0.881	(0.700 – 1.110)	0.885	(0.703 – 1.115)	0.880	(0.699 – 1.108)	0.884	(0.702 – 1.114)
Non-Hispanic Black	1.653***	(1.285 – 2.127)	1.660***	(1.290 – 2.136)	2.248***	(1.612 – 3.136)	2.278***	(1.630 – 3.183)
Socioeconomic Status								
Insurance Coverage (yes=1)	3.489***	(2.740 – 4.442)	3.658***	(2.568 – 5.211)	3.512***	(2.757 – 4.475)	3.852***	(2.688 – 5.520)
Poverty Status (poor=1)	0.901**	(0.841 – 0.965)	0.900**	(0.840 – 0.965)	0.901**	(0.841 – 0.966)	0.901**	(0.841 – 0.966)
Interaction Terms								
Insurance*Believers			0.708	(0.348 – 1.440)			0.672	(0.328 – 1.374)
Insurance*Competence Skeptics			0.730	(0.263 – 2.020)			0.636	(0.231 – 1.753)
Insurance*Values Skeptics			1.060	(0.630 – 1.782)			0.982	(0.580 – 1.661)
Black* Believers					0.721	(0.464 – 1.119)	0.701	(0.451 – 1.091)
Black* Competence Skeptics					0.345**	(0.182 – 0.654)	0.338***	(0.178 – 0.639)
Black* Values Skeptics					0.629*	(0.434 – 0.911)	0.628*	(0.432 – 0.912)

	Model-1		Model-2		Model-3		Model-4	
Variables	**Odds Ratio**	**C.I.**	**Odds Ratio**	**C.I.**	**Odds Ratio**	**C.I.**	**Odds Ratio**	**C.I.**
Constant	3.219***	(2.186 – 4.740)	3.062***	(1.934 – 4.849)	3.039***	(2.059 – 4.486)	2.770***	(1.735 – 4.420)
AIC	6071.233		6075.651		6064.402		6068.478	

*** p<0.001,

** p<0.01,

* p<0.05,

+ p<0.10; C.I.: confidence interval

Table 5

Logistic Regression Results of Prostate Cancer Test (Male Respondents, 1=following guidelines to have a prostate cancer test).

	Model-1		Model-2		Model-3		Model-4	
Variables	**Odds Ratio**	**C.I.**	**Odds Ratio**	**C.I.**	**Odds Ratio**	**C.I.**	**Odds Ratio**	**C.I.**
Distrust Latent Class (ref=Doubters)								
Believers	1.385*	(1.070 – 1.794)	1.964	(0.542 – 7.120)	1.310+	(0.979 – 1.752)	1.828	(0.493 – 6.772)
Competence skeptics	1.514+	(0.939 – 2.439)	1.441	(0.215 – 9.635)	1.381	(0.812 – 2.350)	1.357	(0.202 – 9.107)
Values skeptics	1.165	(0.919 – 1.476)	1.591	(0.518 – 4.882)	1.089	(0.827 – 1.435)	1.455	(0.466 – 4.539)
Demographics								
Age	1.816***	(1.638 – 2.012)	1.816***	(1.639 – 2.013)	1.812***	(1.634 – 2.009)	1.812***	(1.635 – 2.009)
Educational Attainment								
High School Graduate	1.534*	(1.066 – 2.206)	1.531*	(1.065 – 2.202)	1.537*	(1.069 – 2.211)	1.535*	(1.067 – 2.208)
Some College Education	1.884**	(1.273 – 2.786)	1.880**	(1.270 – 2.782)	1.892**	(1.278 – 2.799)	1.887**	(1.275 – 2.795)
College Graduate	2.448***	(1.660 – 3.609)	2.446***	(1.658 – 3.607)	2.460***	(1.668 – 3.628)	2.457***	(1.666 – 3.625)
Post-college Degree	2.137***	(1.428 – 3.196)	2.134***	(1.426 – 3.193)	2.145***	(1.434 – 3.210)	2.142***	(1.432 – 3.206)
Race/Ethnicity (ref=Others)								
Non-Hispanic White	0.898	(0.632 – 1.276)	0.906	(0.638 – 1.288)	0.902	(0.635 – 1.280)	0.909	(0.639 – 1.292)
Non-Hispanic Black	1.144	(0.771 – 1.698)	1.151	(0.775 – 1.709)	0.981	(0.592 – 1.624)	0.992	(0.598 – 1.646)
Socioeconomic Status								
Insurance Coverage (yes=1)	3.343***	(2.073 – 5.393)	4.081**	(1.732 – 9.616)	3.339***	(2.068 – 5.390)	4.030**	(1.710 – 9.497)
Poverty Status (poor=1)	0.832**	(0.740 – 0.935)	0.831**	(0.739 – 0.934)	0.830**	(0.738 – 0.934)	0.829**	(0.737 – 0.933)
Interaction Terms								
Insurance*Believers			0.694	(0.186 – 2.584)			0.707	(0.189 – 2.650)
Insurance*Competence Skeptics			1.058	(0.149 – 7.521)			1.027	(0.143 – 7.379)
Insurance*Values Skeptics			0.721	(0.229 – 2.270)			0.739	(0.234 – 2.331)
Black* Believers					1.222	(0.623 – 2.398)	1.206	(0.613 – 2.371)
Black* Competence Skeptics					1.481	(0.430 – 5.103)	1.451	(0.418 – 5.044)
Black* Values Skeptics					1.284	(0.743 – 2.217)	1.275	(0.737 – 2.205)

	Model-1		Model-2		Model-3		Model-4	
Variables	**Odds Ratio**	**C.I.**	**Odds Ratio**	**C.I.**	**Odds Ratio**	**C.I.**	**Odds Ratio**	**C.I.**
Constant	0.031***	(0.015 – 0.064)	0.025***	(0.009 – 0.069)	0.032***	(0.015 – 0.068)	0.027***	(0.010 – 0.074)
AIC	2704.43		2709.922		2709.418		2714.992	

*** p<0.001,

** p<0.01,

* p<0.05,

+ p<0.10; C.I.: confidence interval