

The Public Health Disaster Trust Scale: Validation of a Brief Measure

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Context: Trust contributes to community resilience and its preparedness capability by the critical influence it has on the community's responses to public health recommendations before, during, and after disasters. However, trust in public health is a multifactorial concept that has rarely been defined and measured empirically in public health jurisdictional risk assessment surveys. Measuring trust helps public health departments identify and ameliorate a threat to effective risk communications and increase resilience. Such a measure should be brief to be incorporated into assessments conducted by public health departments. **Objective:** We report on a brief scale of public health disaster-related trust, its psychometric properties, and its validity. **Design:** On the basis of a literature review, our conceptual model of public health disaster-related trust and previously conducted focus groups, we postulated that public health disaster-related trust includes 4 major domains: competency, honesty, fairness, and confidentiality.

Setting: A random-digit-dialed telephone survey of the Los Angeles county population, conducted in 2004-2005 in 6 languages. **Participants:** Two thousand five hundred eighty-eight adults aged 18 years and older including oversamples of African Americans and Asian Americans.

Main Outcome Measures: Trust is measured by 4 items scored on a 4-point Likert scale. A summary score from 4 to 16 was constructed. **Results:** Scores ranged from 4 to 16 and were normally distributed with a mean of 8.5 (SD 2.7). Cronbach $\alpha = 0.79$. As hypothesized, scores were lower among racial/ethnic minority populations than whites. Also, trust was associated with lower likelihood of following public health recommendations in a hypothetical disaster and lower likelihood of household disaster

preparedness. **Conclusions:** The Public Health Disaster Trust scale may facilitate identifying communities where trust is low and prioritizing them for inclusion in community partnership building efforts under Function 2 of Centers for Disease Control and Prevention's Public Health Preparedness Capability 1. It is brief, reliable, and validated in multiple ethnic populations and languages.

Trust in public health activities during public health emergencies or disasters facilitates public health responses, ensures the community's health, and supports community resilience.¹⁻⁶ In the aftermath of the 2001 anthrax attacks and during Hurricane Katrina and the 2009 H1N1 influenza pandemic, trust shaped the population's perceptions about public health authorities and contributed to behaviors that increased exposure to harm (eg, vaccine refusal and failure to evacuate).⁷⁻¹⁰ Reports from the 2001 anthrax attacks document how African-Americans and other vulnerable groups felt betrayed by the United States Postal Service, public health authorities in the District of Columbia, and the Centers

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for Disease Control and Prevention.⁷ Moderate adherence rates to the antibiotics and low take up rates of the vaccine were observed, particularly among vulnerable populations. Trust was similarly linked to low rates of vaccination in the recent influenza pandemic in both the United States and worldwide.^{9,11-13} The national survey by Quinn, Freimuth and Kumar¹⁴ on H1N1 found that trust was directly and significantly correlated with respondents' willingness to take oseltamivir (Tamiflu) with the understanding that its emergency use for H1N1 was not the indication for which its use was approved. In sum, without trust in public health, people are more likely to ignore critical messages during a disaster and building community resilience to disasters is more difficult.

Because of the substantial role that trust plays in citizens' response to these situations, being able to measure and improve it is critical to determining risks to the health of the jurisdiction.¹⁵ Given the national focus on building community resilience, the concern that vulnerable populations may be disproportionately affected by disasters, and the need among public health departments' for useable metrics to assess community preparedness capability, we sought to develop and validate a brief scale to measure the community's trust in public health regarding disasters. We anticipate that public health departments using this scale will be able to identify populations and communities with low trust in their public health system and can begin to work to develop solutions before a disaster occurs.

● Background and Significance

Research on the determinants of trust identifies marginalized groups, particularly African Americans, as being more distrustful of people.^{16,17} This is likely because trust is reduced by negative personal experiences such as individual misfortune and the perception of being part of a discriminated group.¹⁸ In medicine, several studies suggest that minorities have less trust in the larger health system¹⁹⁻²² and medical research in particular^{23,24} than do whites. Thus, lower trust in the health care system and negative past experiences with the field of public health may serve to lower trust in public health today.

In addition, population characteristics that are related to disaster vulnerability such as race, disability, and income influence people's trust of the public health system.³ This is concerning because these groups are already at increased risk for harm during a disaster.²⁵ Low perceptions of public health among these groups may be due to several factors including communication gaps,²⁶ fears about citizenship status,^{27,28} or poor experiences with the health care or public health systems.⁸

For example, the field of public health has a long history of racism and discrimination on the basis of class. Unethical public health practices have affected a wide swath of the population and include the unnecessary quarantine of San Francisco's Chinatown at the turn of the last century,²⁹ unfair distribution of health care resources during the 1918 pandemic flu,³⁰ reduced access to hospital care during segregation, and inappropriate scientific experimentation such as the Tuskegee syphilis experiment.^{31,32}

● Methods

Development of the Public Health Disaster Trust Scale

Trust is generally described as the belief that one's interests will be cared for by another entity. It is related to vulnerability in the sense that as the risk of harm increases in an interaction, the need to trust and the capacity to distrust also increases.²⁴ One may have trust in another person (interpersonal trust) or an institution (social trust). The important difference between the 2 is that interpersonal trust is socialized through repeated interactions over time, and social trust is often a function of general reputation rather than firsthand knowledge.³³ Our scale measures trust in the institution of public health rather than the individual actors in this field.

We sought to develop a short scale of trust in public health. Our public health department routinely fields population surveys, which can be costly or burdensome to respondents. Every item costs money in a survey, and telephone surveys are increasingly challenged by low response rates.³⁴ A short scale of trust in public health also helps limit the respondent burden and the cost of conducting the survey in which this scale would be delivered. Also, population assessments that aim to compare several populations or correlate 2 measures may safely use shorter scales. These generally are the primary aims of our health department's risk assessments. At the time of the study, scales that measured trust in the health care system or personnel contained 10 to 24 items.^{19,24} On the basis of a literature review and community focus groups³⁵ we postulated that public health disaster-related trust could be well measured with 4 major domains: honesty—conveying truthful information, fairness—the belief that others will act fairly and in your best interest, competency—having technical proficiency, and confidentiality—maintaining privacy and using sensitive information appropriately.³⁶ For instance, we found in focus groups with African American residents of Los Angeles that the concept of honesty was most frequently related to trust and

that fairness and competency were also important. Historically, concerns about confidentiality have been important among racial and ethnic minority groups.

We developed 4 items to assess trust along these domains. The 4 items started with the introduction, "for the next few questions, imagine that a terrorist or bioterrorist attack were to occur in Los Angeles County." The 4 items read as follows. The item on competency asked, "How confident are you that the County's public health system can respond *effectively* to protect the health of the public—very confident, somewhat confident, not too confident or not at all confident?" The item on fairness asked, "How confident are you that the County's public health system will respond *fairly* to your health needs, regardless of your race, ethnicity, income or other personal characteristics—very confident, somewhat confident, not too confident, or not at all confident?" The item on honesty asked, "How confident are you that the County's public health system will provide *honest* information to the public—very confident, somewhat confident, not too confident or not at all confident?" Finally, the item on confidentiality asked, "If there were an attack and the County's public health system needed to collect information on you, such as race, income and citizenship, how confident are you that this information would *not* be used against you—very confident, somewhat confident, not too confident or not at all confident?" Respondents chose one answer from the 4 Likert scale choices provided at the end of each question.

Items were translated into 5 languages, pilot tested, and fielded as part the 2004 Public Health Response to Emergent Threats Survey, a random-digit-dialed telephone survey of the Los Angeles County population (N = 2588). Public Health Response to Emergent Threats Survey served as the county's risk assessment survey.

Sample selection

In Public Health Response to Emergent Threats Survey, adults aged 18 years and older were surveyed between October 2004 and January 2005 in a 2-phase sample design. Phase 1 consisted of a random sampling of Los Angeles adults using an unrestricted random digit dial sample of households within Los Angeles County. Phase 2 augmented the number of Asians and African Americans included in the overall survey and was conducted by means of a random-digit-dial sample of households in high-density Asian and African American population areas of the county. Of the 10 882 households contacted, 6426 persons were successfully screened for a cooperation rate of 59.1%. There were 3838 people who were not eligible for study inclusion (eg, no adult in household, no Asians or African

Americans in household in phase 2) and 2588 completed the interview. Telephone interviews, conducted by trained staff using a computer-assisted telephone interviewing system, offered participants the option of answering the survey items in English, Spanish, Mandarin, Cantonese, Korean, or Vietnamese.

● Measures

Disaster preparedness and behavior measures

To test construct validity, we hypothesized that trust in public health would be related to population characteristics and citizen behaviors during an emergency. First, we hypothesized that trust is lower among certain ethnic minorities and language groups. Second, we hypothesized that lower trust is associated with lower likelihood of following public health recommendations in a bioterrorist event and that lower trust is associated with lower likelihood of household disaster preparedness.

Willingness to follow public health recommendations was measured with a single item asking, "If the head of your local government and officials from the county health department announced that you and everyone else in your neighborhood should go to the nearest public school because of a terrorist or bioterrorist attack, which of the following describes what you would likely do: Would you go there immediately, would you go there later when it was convenient, would you not go until you got more information, or would you not go at all?" Individual household preparedness was measured in 2 domains, possession of disaster supplies and having an emergency communication plan. Possession of disaster supplies was assessed by asking whether respondents had any of the following 5 items: 3-day supply of food and water, a battery-powered radio, a first aid kit, a flashlight, and extra or spare batteries. Because preparedness may be considered to be in possession of all 5 items,³⁷ we created a dichotomous category for "supplied" (persons who had all 5 items) and "not supplied" (persons who have 4 items or less). The emergency communication plan was assessed with an item asking, "do you or does your household have a family emergency plan where you and family members would meet or call after a disaster?"

Independent variables

Population characteristics were measured by respondent reports of gender, age, race and ethnicity, marital status, education, household income, preferred language of interview, and household location

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(determined by having an address in one of the 6 LACDPH Strategic Planning Areas [SPA], Antelope Valley, San Fernando, Metro, West, South, East, and South Bay).

● **Analysis**

Responses to the trust items were individually scored as follows: not at all confident = 1, not too confident = 2, somewhat confident = 3, and very confident = 4. Individual item scores were summed to create the overall scale score. So, scale scores could range from 4 to 16, with higher scores indicating more trust. We performed univariate analyses to characterize the sample and bivariate analyses to determine the relationship between mean trust score and each of the population characteristic variables. We then performed separate multivariate linear regression analyses with trust score as the dependent variable. Finally, we performed separate multivariate logistic regression analyses with each of the public health behaviors as the dependent variables of interest. Our intent was to measure the independent relationship between trust score and the public health behavior while adjusting for confounding by the other covariates. Data analysis was conducted using SAS version 9.1.3 (SAS Institute Inc, Cary, North Carolina). This secondary analysis of anonymous data was exempted from institutional review board review.

We constructed an analytical weight for each participant comprised 2 component weight fields. The first weight field is a sampling weight to adjust for the number of telephone lines in the household and the probability of selection of an individual within a household. To reduce the bias derived from excluding County residents currently without telephone service and cell-phone only service from the sample, the responses of those who reported being without landline telephone service for a time in the past 3 years were given a greater weight. The second weight field is a population-level adjustment and converts the random sample data to projections of the overall population of all adults in the county (gender, age, education, race/ethnicity, and geographical location of households). A comparison of the weighted study sample to the census data revealed that the study results could be used to generate population estimates of Los Angeles County. Weighted data are presented here as a reasonable approximation of the responses of all the adult residents of Los Angeles County. All *P* values are based on 2-tailed tests.

● **Results**

The sample characteristics are contained in Table 1. Public Health Response to Emergent Threats Survey

TABLE 1 ● Sample Characteristics and Associated Unadjusted Mean Trust Score

Individual Characteristic	Percentage of Sample (n = 2,588)	Unadjusted Mean Trust Score
All		11.5
Gender ^a		
Male	46.3	11.6
Female	53.7	11.4
Age group, ^a y		
18-24	10.2	11.4
25-29	8.8	11.4
30-39	20.9	11.6
40-49	20.9	11.3
50-59	17.7	11.4
60-64	6.2	11.5
65 or over	15.3	12.0
Marital status ^a		
Married/living together	57.2	11.7
Currently not married	42.8	11.3
Race/ethnicity ^b		
White	30.4	11.3
Latino	31.7	11.6
African American	8.6	10.5
Asian Pacific Islander	28.1	12.0
Al/mixed/other	1.2	10.7
Education ^b		
Less than high school	15.1	12.1
High school	21.5	11.7
Some college or trade school	24.6	11.1
College or postgraduate degree	38.9	11.4
Household income		
Less than \$10 000	10.9	11.5
\$10 000-\$19 999	15.1	11.8
\$20 000-\$29 999	14.4	11.7
\$30 000-\$39 999	13.6	11.6
\$40,000-\$49,999	11.5	11.2
\$50,000-\$75,000	13.8	11.4
More than \$75,000	20.8	11.4
Language at Interview ^b		
English	71.5	11.3
Spanish	17.3	12.0
Mandarin	3.3	13.9
Cantonese	2.5	12.8
Korean	4.0	9.2
Vietnamese	1.5	14.4
Service Planning Area ^b		
San Gabriel	28.3	11.9
Antelope Valley	3.2	11.5
San Fernando	16.7	11.2
Metro	12.3	11.5
West	6.7	11.2
South	7.0	11.1
East	13.4	11.7
South Bay	12.4	11.1

^a*P* < .05.

^b*P* < .001.

included slightly more women than men. About 60% were aged between 30 and 59 years and most (about 57%) were married. There were a substantial proportion of minorities surveyed (70%). A large proportion (85%) had at least a high school diploma and slightly more than half earned at least \$49 000. The preferred language for conducting the survey was English (about 72% of respondents). The largest non-English language of preference was Spanish. More than three-quarters were US citizens and slightly less than half were born outside the United States. The regions of South Los Angeles, West Los Angeles, and the Antelope Valley have the fewest proportion of respondents who participated.

The resulting scale scores ranged from 4 to 16 out of a possible 4 to 16 (higher scores indicating more trust). Scores were normally distributed and the mean score was 8.5 (SD 2.7). There was little clustering at the upper or lower ends of the scale by item, indicating the absence of “ceiling” or “floor effects,” that is, the majority of respondents did not answer the trust items with an extreme response such as “very confident” or “not at all confident.” (If all respondents are very confident or not at all confident about one item then that item does discriminate between respondents. It does not contribute to the reliability of the scale.) Corrected item-total correlations were used to assess how well one item’s score is consistent with the composite score from the remaining items. The corrected item-total correlations ranged from 0.73 to 0.78, indicating that the score of each individual item was strongly, positively correlated with the combined score of the remaining items. This is evidence that each of the 4 items are consistent with the rest of the scale and should not be dropped. Further support that the 4 items in the trust scale are related as a group is provided by Cronbach α . Cronbach α is a measure of internal consistency and the α coefficient was 0.79, which is considered good in most social science situations. Finally, we used principal components analysis to assess whether the scale did indeed measure the one underlying construct, trust. Principal components analysis disclosed that all items loaded on one factor with an eigenvalue of 2.45. The eigenvalue of the next factor was <1. This suggests that the scale items are unidimensional, that is, the 4 items together measure one underlying construct. A factor with an eigenvalue <1 is considered noncontributory—not explaining any more underlying factors—and is customarily ignored.

As hypothesized, trust scores were lower among several racial or ethnic minority populations than among whites. African Americans had lower trust (Table 1) even in the multivariate analyses (Table 2). Korean speakers were also much less trusting of public health than all groups, while Chinese (Mandarin and Cantonese) and Vietnamese speakers had very high levels of trust (Tables 1 and 2).

TABLE 2 • Results of Multivariate Linear Regression Model Predicting Trust Score^a

	Regression Coefficient	P
Gender		
Female	-0.16	0.14
Age, y		
25-29	0.01	0.97
30-39	0.16	0.40
40-49	0.07	0.73
50-59	-0.05	0.80
60-64	0.50	0.09
65 or over	0.58	0.01
Marital status		
Not married	-0.02	0.86
Race/ethnicity		
Latino	-0.30	0.08
African American	-0.44	0.04
Asian Pacific Islanders	0.32	0.15
AI/mixed/other	-0.40	0.80
Preferred language of interview		
Spanish	0.86	<.0001
Mandarin	2.15	<.0001
Cantonese	1.27	0.01
Korean	-2.07	0.001
Vietnamese	2.85	<.0001
SPA		
Antelope Valley	-0.01	0.98
San Fernando	-0.27	0.15
Metro	-0.04	0.85
West	0.06	0.82
South	-0.21	0.39
East	0.01	0.98
South Bay	-0.52	0.01
Education		
Less than high school	0.57	0.01
High school	0.34	0.06
Some college or trade school	-0.17	0.30
Household annual income		
Less than \$10 000	-0.46	0.06
\$10 000-\$20 000	-0.09	0.7
\$20 000-\$30 000	-0.19	0.39
\$30 000-\$40 000	0.08	0.71
\$40 000-\$50 000	-0.29	0.21
\$50 000-\$75 000	0.08	0.72
Intercept	11.43	<.0001

^aReference group characteristics: male, age 18-24 y, married/living together, whites, college or postgraduate degree, annual income more than \$75 000, interviewed in English, living in San Gabriel.

As hypothesized, trust was significantly related to various preparedness behaviors. Table 3 shows that persons who responded that they would immediately follow the recommended action of government authorities to evacuate in the hypothetical terrorist event had

[T2]

[T3]

TABLE 3 ● Unadjusted Mean Trust Score by Public Health Behavior

Public Health Behavior	N	Unadjusted Mean Trust Score (SD)
Follow recommended action ^a		
Go there immediately	1327	11.9 (2.27)
Go later when convenient	154	11.7 (2.27)
Not go until more information	731	10.9 (2.65)
Not go at all	79	9.7 (3.39)
Have all 5 preparedness items ^a		
Yes	1079	11.7 (2.64)
No	1179	11.3 (2.80)
Have a family emergency plan ^a		
Yes	916	11.8 (2.64)
No	1367	11.3 (2.27)

^aAll relationships significant at $P < .0001$.

TABLE 4 ● Trust as a Predictor of Public Health Behaviors, Results of Multivariate Logistic Regression Models

Public Health Behavior	Odds Ratio	95% Confidence Interval
Follow recommended action		
Go there immediately versus other	1.14	1.10-1.18
Have all 5 preparedness items	1.09	1.05-1.13
Have a family emergency plan	1.10	1.06-1.14

^aModels adjusted for age, race, gender, marital status, income, language, and education.

significantly higher trust scores than persons who said they would go when it is convenient, after gathering more information, or not at all. Table 3 also shows that higher trust was associated with having all 5 preparedness items, as well as having an emergency plan. As shown in Table 4, these associations continued even after adjusting for age, race/ethnicity, gender, marital status, income, language, citizenship status, and education.

● Discussion

In building our nation’s health security and resiliency, especially against natural epidemics and bioterrorism, the in-place public health infrastructure will continue to be the first line of defense in the detection, surveillance, and response phases of consequence management. Because trust plays such a critical role in communities’ responses to emergency and public health recommendations before, during, and after disasters, the identification of populations with low trust

may be a useful element for jurisdictional risk assessments to contain. To aid in public health efforts to measure trust in their communities we validated the Public Health Disaster Trust Scale.

The scale demonstrated good psychometric properties. Construct validity was assessed and, as hypothesized, trust scores were lower among African Americans than whites in multivariate analyses. Latino respondents had a higher level of trust in public health compared with non-Latino whites and this is consistent with the results of the national survey by Quinn.¹⁴ Trust was directly related to willingness to follow public health recommendations and to household preparedness. The scale is 79% reliable, which is particularly good given its brevity.

Contrary to our expectations, we found that Asian or Pacific Islanders had the highest levels of trust compared with other ethnic groups except for Koreans. Multivariate analyses that used Asian Pacific Islander ethnic subgroups (not shown) found that Chinese and Vietnamese persons had very high levels of trust. These findings by ethnic group were also mirrored in analyses of primary language, where those who spoke Cantonese, Mandarin, or Vietnamese had very high levels of trust. Results such as these suggest that the different Asian subgroups are not homogeneous with respect to characteristics that may affect trust in public health messages. These findings could be due to sampling error since the number of Asians in the survey is very low, or they could be due to systemic problems in the relationship between public health and the Korean population of Los Angeles relative to other Asian subgroups. For example, there may be a lack of messages directed at Koreans or their perception of local government agencies could be tainted by the lack of response by the Los Angeles Police Department during the Rodney King riots.³⁸ Although we do not see a similar effect in the Service Planning Area that contains Koreatown, it may be that affected individuals have subsequently moved to other Service Planning Areas.

Information such as this is valuable to public health departments. In Los Angeles, for example, the county department of public health is using these data to develop outreach efforts targeted at low trust populations. Such strategies might include involving these groups in planning around local response to disasters. One benefit to this strategy is that these persons are likely to have useful insight into why these groups have low perceptions of public health. Organizations working with these populations might also be able to identify trusted messengers and information networks within these populations that can be used to disseminate public health warnings and directives.

This study is limited by 2 key factors. First, we did not evaluate a large number of potential items to

measure our domains, but instead we chose only 4 items to represent the different domains of trust. This had the advantage of reducing the length of the survey, thereby increasing its feasibility for use in health departments across the country. But in so doing we traded off brevity for universality. Nevertheless, the scale displayed good psychometric properties including a high alpha (particularly good in a brief scale) and appears valid insofar as it had a significant relationship to the hypothesized disaster preparedness behaviors. Thus, we believe there is limited value in making the scale longer.

Second, the study is also limited by its sample. Participants were all residents of Los Angeles County, California, which in many respects is unique from the rest of the country. Los Angeles has a large percentage of minority populations, which may skew trust downward. The profile of disasters that face Los Angeles is also unique. Californians (like many people on the west coast) are primarily concerned with earthquakes, fires, tsunamis, and terrorism. The results may also be impacted if expectations about the performance of public health agencies during these emergencies differ from expectations about their performance during other mishaps, or if the specific perceptions and experiences of Californians are fundamentally different than the rest of the country.

● Conclusion

Trust influences citizens' responses to public health recommendations in a disaster or public health emergency. So, being able to measure and improve it is critical to determining risks to the health of the jurisdiction. The Public Health Disaster Trust Scale is a tool for public health departments' disaster planning and preparedness efforts. The scale will facilitate jurisdictional risk assessments in support of improving community resilience, which is a national priority.⁶ For instance, Function 2 of Centers for Disease Control and Prevention's Public Health Preparedness Capability 1 calls for building community partnerships to support preparedness.¹⁵ This scale may be useful for identifying sociodemographic and geographic communities where trust is comparatively low and prioritizing them for inclusion in community partnership building efforts. Public health departments may use it to identify institutional factors that might enhance or reduce trust through analysis of the domains that make up the scale. Its brevity facilitates its use in an environment of budget shortfalls. Validation in multiple ethnic populations and languages makes it suitable for studying the contribution of this type of distrust to population differences in disaster-related behaviors across the United States.

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Queries to Author

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