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Disaster Preparedness and Health Behaviors: An Empirical Study of Similarities and Differences

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Abstract

Despite being special in many ways, disaster preparedness may overlap with health behaviors such as tobacco avoidance, physical exercise, proper weight control, regular medical checkups, safe alcohol use, and seatbelt use. Similarities in the SES distribution of risk and health orientations might make safety with regard to disasters similar to behaviors that prevent disease. Yet, the two literatures have remained largely separate, and studies have not examined the relationships of the two kinds of activities with one another. To address this gap, I use data from two surveys – one in selected states in the U.S. and one in Los Angeles County – that include items on disaster preparedness and several health behaviors. Analysis of the surveys shows a few similarities between disaster preparedness and health behaviors, but the relationships are weak and differences predominate. Although the need remains for surveys to include measures of both kinds of behaviors, the initial findings suggest that the levels and sociodemographic determinants of disaster preparedness overlap little with those of health behaviors.

Keywords: disaster preparedness, health behaviors, BRFSS, LA County

Introduction

To what extent are social patterns of disaster preparedness associated with behaviors promoting health, such as tobacco avoidance, proper weight maintenance, vigorous exercise, moderate alcohol use, seatbelt use, and regular medical checkups? This question raises issues concerning the nature of social vulnerability to risk in modern society. On the surface, disaster preparation seems to have little in common with the other behaviors. It involves planning and readiness to respond early and quickly to natural, technological, or terrorist hazards, whereas health behaviors involve daily actions to reject or avoid addictive and dangerous tobacco products, eat healthy foods, drink moderate amounts of

alcoholic beverages, participate in activities for physical fitness, minimize motor vehicle injuries through seatbelt use, and prevent health problems with regular doctor visits. Disaster preparedness involves rare but dramatic events that on occasion cause large numbers of casualties from drowning, building collapse, and fires, whereas health behaviors relate to the steady march of premature death—hundreds of thousands per year—from cancers, heart disease, lung disease, cirrhosis of the liver, diabetes, car crashes, and a variety of other causes. Disaster preparedness relies on public service announcements from the media and government to promote voluntary action by households, whereas health behaviors rely on recommendations and treatment by medical professionals or sometimes on formal regulations that, for example, tax cigarettes, prohibit smoking in public places, and fine those not using seatbelts.

However, these behaviors have conceptual similarities as well. Disaster preparedness and the health-promoting behaviors involve risk reduction that might make them part of a health lifestyle (Cockerham 2005), and all are expressly devoted to promotion of health and prevention of injury or disease (Eisenman et al. 2006). Research on disaster preparedness is motivated by goals of protecting the public from danger (Mileti 1999). The frequent and intense hurricanes during the 2005 season and the disastrous flooding of New Orleans caused by Hurricane Katrina have highlighted the importance of preparation (Donner and Rodriguez 2008). Research on health behaviors is similarly motivated by goals of improving health and extending life. Estimates suggest that behavioral causes of death relating to smoking, poor diet, inactivity, and alcohol consumption accounted for 38.2 percent of deaths in 2000 (Mokdad et al. 2004). Health-promoting resources, values, and goals might encourage the adoption of several, rather than a single, health behavior, and, disaster preparedness might fit with the constellation of positive health practices.

Relatedly, the social distributions of disaster preparedness and health behaviors may similarly reflect disparities by socioeconomic status (SES). For health behaviors, SES influences appear strong and consistent. Those with higher education, better jobs, and greater income smoke less than others (Barbeau, Krieger, and Soobader 2004), eat a more nutritious diet, exercise more often, consume alcohol in moderation, always use seatbelts, and have regular medical checkups (Cutler and Lleras-Muney 2009; Pampel, Krueger, and Denney 2010). Indeed, increasing attention to promoting healthy behavior in recent decades may have exacerbated SES inequalities. For example, as high SES groups have responded more to publicity over the last few decades about the dangers of tobacco use, smoking has become concentrated among low SES groups (Link 2008; Pampel 2008). For disaster preparedness, studies have found some evidence that those with higher education, better jobs, and greater income do more to prepare (Lindell et al. 1997; National Research Council 2006; Tierney, Lindell, and Perry 2001). Attention to disaster preparedness for hurricanes, earthquakes, and terrorist attacks may have motivated high SES groups with appropriate resources to adopt best practices. As illustrated by the

deaths and injuries to minorities and the poor in New Orleans after Hurricane Katrina, disaster risks seem increasingly concentrated among low SES groups (Cutter and Emrich 2006; Tierney 2006). However, contradictory evidence exists as well. Review studies suggest that demographic variables have inconsistent associations with disaster preparedness (Lindell and Perry 2000; Lindell forthcoming). It may be that the social distributions of disaster preparedness and health behaviors have little in common.

To help answer the question about the similarities and differences of disaster preparedness with health behaviors—and to better understand the nature of health activities – this study has two goals. It first examines the associations among multiple health behaviors using two rare data sets that include items on both disaster preparedness and health behavior. Second, it examines the relationships of the multiple health behaviors to SES and related sociodemographic characteristics, such as race, ethnicity, age, gender, and marital status. Differences and similarities may show not only in the outcomes themselves but also in the direction and strength of the determinants of the outcomes. The level of disaster preparedness and the strength of the SES gradient or slope may correlate positively with the levels and SES gradients of health behaviors. Alternatively, the special nature of disaster preparedness, which involves safety from low probability but high consequence events, may mean that it correlates only weakly with health behaviors and that its relationship with SES is considerably weaker than for health behaviors.

Two huge streams of interdisciplinary literature, one on disaster preparedness in the hazards field and one on health promotion in public health, have largely proceeded independently. Each literature has made major contributions to the understanding of human behavior but has not highlighted potential links to the other. For example, work in the area of disaster preparedness has called for research to better understand the concept of social vulnerability (National Research Council 2006, p.117). Comparing social vulnerability to disasters with social vulnerability to other types of risky or unhealthy behavior may help in this goal. The combined study of disaster preparedness and health behaviors may add to both literatures. However, to avoid prejudging the degree of similarity, I refer throughout to disaster preparedness as distinct from health behaviors.

The Role of SES

Consider in some more detail how varied goals of risk reduction and health promotion may encompass both disaster preparedness and health behaviors and differ by SES. In the area of disaster preparedness, Tierney et al. (2001, p. 30) note that research "has documented the various ways in which sociodemographic information and sociocultural factors affect both the receipt of risk information and what people ultimately do with the information they receive." High SES groups appear to respond more than others to messages on the importance of preparation (Blaikie et al. 2004). They

are more likely to follow government recommendations that residents of high-risk areas such as the Pacific coast (earthquakes), Atlantic and Gulf coasts (hurricanes), and Midwest river basins (flooding) do the following: have an escape and response plan for an emergency, discuss and rehearse the plan with family members, set aside and periodically replace emergency food, water, and supplies, learn about local emergency procedures and warning systems, purchase adequate insurance, and be ready to evacuate or find shelter immediately on official warning (FEMA 2010). However, the literature attributes more importance to risk perceptions, hazard experience, and hazard proximity than to SES (Lindell forthcoming; Lindell, Arlikatti, and Prater 2009).

In the public health literature, studies have documented consistent SES influenes on a variety of health behaviors. To consider one prominent example, research on tobacco use has described growing SES disparities (Pampel 2008) and examined how SES groups respond differently to anti-smoking policies and publicity campaigns (Department of Health and Human Services 2000; Link 2008). Studies of health behaviors relating to diet, exercise, and preventive care generally demonstrate similar relationships with SES (Cutler and Lleras-Muney 2009; Pampel, Krueger, and Denney 2010), as do studies of health and mortality more generally (Hummer and Lariscy 2011; Kitagawa and Hauser 1973).

Several underlying mechanisms may contribute to the importance of SES and to possible similarities in the socioeconomic determinants of disaster preparedness and health behaviors. Higher SES groups have the resources to prepare for disasters and adopt healthy behaviors. Monetary resources are crucial, as groups in poverty often can afford housing only in areas of higher risk for natural hazards and lack the money to pay for expensive household adjustments to protect against the harm of a disaster (Tierney et al. 2001; Russell, Goltz, and Bourque 1995). Monetary resources are similarly helpful in purchasing expensive anti-smoking aids, gym memberships, and lean meats, fruits, and vegetables. However, socioeconomic resources go beyond finances – they involve knowledge, problem-solving skills, and confidence in overcoming obstacles that come from educational and occupational attainment (Mirowsky and Ross 2003). Disadvantaged groups lack access to information on disaster preparedness and warnings that high SES groups obtain (Fothergill and Peek 2004; Lindell et al. 1997; Peacock 2003; Phillips and Morrow 2007). Recognition of lack of information and resources may in turn lead to low self-efficacy or fatalism that hampers adoption of disaster adjustments (Heller et al. 2005; Mulilis and Duval 1995). Information on the benefits of non-smoking, nutritious food, and exercise are widely known, but the ability to effectively use the information and change behavior varies with SES (Chang and Lauderdale 2009; Cutler and Lleras-Muney 2009).

Resources have other kinds of influences that relate more to motives than means. Deprived groups often face a struggle in daily life to meet demands that exceed their capacities, decreasing motivation for disaster preparedness and healthy behavior.

Preparation for a low-probability (though high consequence) event in the future has little urgency relative to dealing with the difficulties of daily living (National Research Council 2006; Tierney 2006). Thus, preparedness for disasters has low salience for disadvantaged SES households (Tierney et al. 2001). Low salience characterizes poor communities as well as persons. The economic vulnerability of poorer communities means low SES persons receive less social support for disaster preparedness and are less well integrated into networks of support for evacuation (West and Orr 2007). Similar motivations apply to unhealthy behavior; indulging in tobacco, inactivity, and excess food and alcohol, despite the long-term health risks of these activities, can help relieve chronic stress among disadvantaged groups (Wilkinson 1996, p. 185). Indeed, these groups may reason that, given the other sources of risk and premature mortality they face, the effort to adopt healthy behaviors will do them less good than it does for others (Lawlor et al., 2003). In contrast, high SES groups have more to gain from safe behavior and longevity. They face greater loss of earnings and wealth with an early death and gain greater payoff in terms of longevity from investments in healthy behavior (Grossman 1972). As occurs with disaster preparedness, health behaviors among low SES groups also receive less social support at the community level (Kawachi, Kennedy, and Glass 1999).

Given the potential importance of SES to disaster preparedness and health behaviors, both literatures have argued for more attention to underlying sources of inequality. In focusing on health and mortality more generally, Link and Phelan (1995) argue that SES is a fundamental cause. Despite changes over the last century in the major causes of death and disability, remarkable improvements in medical care, and huge investments of government programs, SES remains just as important to mortality today – or even more important (Jemal et al. 2008; Preston and Elo 1995) – as in the past. Beneficial social connections and flexible resources allow people in the upper social strata to stay on the forefront of health advances, even as these advances take on very different forms over time (Link and Phelan 1995).

In regard to root causes of disaster preparedness, a growing literature has emphasized the importance of social vulnerability and resiliency as crucial components of the harm of natural disasters (Cutter and Emrich 2006; Tierney 2006). Going beyond description of the socioeconomic distribution of vulnerability, Blaikie et al. (2004) argue that understanding the unsafe conditions underlying vulnerability requires attention to root causes in access to capabilities, assets, power, and livelihoods. The distribution of resources thus affects the ability to anticipate, prepare for, and resist natural disasters and emergencies, and vulnerability related to class, occupation, ethnicity, gender, age, and employment is a product of the social, economic, and political environment.

In summary, arguments for similarities in disaster preparedness and health behaviors lead to two hypotheses: H1: Disaster preparedness and health behaviors are significantly

correlated with each other; and H2: Sociodemographic variables are significantly and similarly correlated with both disaster preparedness and health behaviors.

An Alternative Hypothesis

Despite reasons for similarity in SES influences, other arguments and studies suggest reasons for differences between disaster preparedness and health behaviors. Lindell et al. (1997) and Lindell and Perry (2000) note that sociodemographic variables are distant enough from disaster preparedness that other factors related to social support and personal resources have more importance. More recently, Lindell (forthcoming) concludes that demographic variables are unreliable predictors of hazard adjustment. Eisenman et al. (2006) find limited influence of education and income on preparedness for a terrorist event. Cutler and Glaeser (2005) find low correlations among several non-disaster health behaviors. Weak effects may stem from the fact that disaster preparedness is subject to fewer legal regulations and informal sanctions than many health behaviors. For example, various regulations govern the sale and prices of cigarettes and the locations in which people can smoke; fines exist in many states for persons not using seatbelts; and moral disapproval of smoking, inactivity, and obesity discourages unhealthy habits. High SES groups appear to respond most to these formal and informal sanctions, thus creating large disparities (Link 2008). In contrast, few regulations require disaster preparedness. Public service ads encourage certain actions in areas prone to natural disasters, governments and business often develop disaster response plans, and televised warnings call for evacuations. The lower salience of disaster preparedness relative to health behaviors may make SES less important in most circumstances. The end result might be weak relationships of disaster preparedness with both SES and health behaviors.

In contrast to the two hypotheses, alternative arguments suggest the following: Disaster preparedness and health behaviors are weakly and inconsistently correlated with each other, and sociodemographic variables are weakly and inconsistently correlated with both disaster preparedness and health behaviors.

Methods

Data

To examine similarities and differences in health behaviors and test more specific hypotheses about the influence of SES, data sets must include survey items on both disaster preparedness and health practices. Unfortunately, few surveys meet this criterion. The yearly National Health Interview Survey contains information on SES, related characteristics, and a diverse set of health behaviors but nothing on disaster preparedness. Numerous data sets on household preparedness actions in areas of California are

available from the UCLA Earthquake Survey Data Archive, and numerous data sets on preparedness for terrorist events are available from the University of Maryland Terrorism and Preparedness Data Resources Center, but the surveys rarely ask about health practices.

Two surveys have both types of questions but only for limited geographic areas of the United States. First, the Behavioral Risk Factor State System (BRFSS), an ongoing collaborative project between the Centers for Disease Control and the U.S. states and territories that began in 1984, gathers state-specific survey information on health for a representative sample of the non-institutionalized population ages 18 and over (CDC 2010). The surveys use random-digit dialing and telephone interviews and mix core questions asked by all states with voluntary modules selected by individual states. Optional questions on disaster preparedness were first used by three states in 2006 (Montana, Nevada, Tennessee), followed by three states in 2007 (Delaware, Louisiana, New Hampshire), and two states in 2008 (Georgia, Montana). With Montana participating twice, seven states have data on disaster preparedness. All states ask questions on smoking, weight and height, alcohol use, exercise, and medical checkups for all three years, and all states ask about drunk driving and seatbelt use in 2006 and 2008 but not 2007. By no means representative of the larger nation, these states nonetheless offer an initial, though limited, opportunity to compare disaster preparedness to health behaviors.

Second, the 2005 Los Angeles County Health Survey (LACHS) asks about both disaster preparedness and health behaviors (LA County Department of Public Health 2007a). Although limited to one county, the survey has special relevance to disaster preparedness because of the risks of earthquakes, wildfires, mudslides, and terrorist attacks in the area. The relationship of disaster preparedness to health behaviors among residents in the high-risk areas may differ from those in other areas of the United States. The random-digit-dialed telephone survey covers the non-institutionalized population age 18 and over in the county, and the sampling design interviews one adult from each randomly selected household. Interviews were done in one of seven languages (English, Spanish, Mandarin, Cantonese, Korean, Vietnamese, and Armenian).

For both surveys, I select persons ages 25 to 64. Disaster preparedness and health behaviors are, of course, important at all ages. But schooling and other components of SES are often incomplete before age 25, and differential mortality by SES can bias comparisons involving smoking and weight in old age. For the adult age groups, both samples contain weights that adjust for sampling probability and non-response.

Measures

Both the BRFSS and LACHS measure disaster preparedness with a seven-item inventory. The BRFSS items are as follows: 1) How well prepared is your household to

safely withstand a large-scale disaster or emergency? 2) Does your household have a disaster evacuation plan? 3) Does your household have a 3-day supply of water for everyone who lives there? 4) Does your household have a 3-day supply of non-perishable food for everyone who lives there? 5) Does your household have a 3-day supply of prescription medication for each person who takes prescribed medicines? 6) Does your household have a working battery operated radio and working batteries for your use if the electricity is out? 7) Does your household have a working flashlight and working batteries for your use if the electricity is out? All items but the first have yes or no responses, while the first has very prepared, somewhat prepared, and not prepared as responses. The first item on preparation for a disaster depends on the subjective evaluation of respondents, but the other items on water, batteries, and prescriptions reflect more objective conditions.

The LACHS includes most of the same items but differs in a few ways. The question on how well prepared the household is for a disaster has five choices (completely, mostly, somewhat, not very, and not at all) rather than three; one item asks about a 3-day supply of food and water rather than two items; two items ask about having a first aid kit and spare batteries; and no item asks about a supply of prescriptions.

To summarize the degree of preparedness, both sets of survey items are standardized and summed to create a scale with a mean of zero and a standard deviation of one. The BRFSS has a lower alpha reliability (.59) than the LACHS (.70).

Note that the items, designed for surveys of broad samples across diverse geographical contexts, refer to inexpensive actions. Other, more specific and expensive mitigation efforts, such as buying shutters in hurricane-prone areas or renovating homes with special construction and piping materials in earthquake-prone areas, would more strongly favor high-income households. The items instead aim to tap the knowledge and motivation for preparedness more than the economic resources for preparedness.

Six measures of health behaviors are available, all coded so that health-promoting actions have higher scores.

- First, a measure of currently does not smoke (including former smokers) equals one and currently smokes equals zero.
- Second, the measures of physical exercise differ in the two surveys. The BRFSS simply asks if the respondent exercised in the past month (defined as, other than in a regular job, participation in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise). Those answering yes are coded one and others zero. The LACHS creates a more detailed measure with seven values ranging from a score of 1 (no physical activity) to 7 (participates in both vigorous and moderate activity).
- Third, the body mass index measures weight relative to height in the BRFSS, while it measures four categories (underweight, normal weight, overweight, and

obese) in the LACHS. Since both the lowest and highest categories can indicate health problems and being normal or overweight shows no special risk for premature death (Flegal et al. 2005), I create a dummy variable equal to one for those of normal weight or overweight and zero for those underweight or obese.

- Fourth, the BRFSS asks about the time since the last visit to the doctor for a regular checkup, with four equal to within the past year, three equal to within the past two years, two equal to within the past five years, and one equal to five or more years ago. The LACHS asks if the respondent has a regular source of care (coded 1) or not (coded 0).
- Fifth, alcohol use is measured by three dummy variables in each survey: whether or not the respondent is a heavy drinker (more than 59 drinks over the last month), whether or not the respondent has binged over the last month (more than five drinks for males or four drinks for females on at least one occasion), and whether the respondent reported driving when they perhaps had too much to drink (available only for 2006 and 2008 in the BRFSS). Summing the three items and reversing the codes offers a summary score of safe drinking.
- Sixth, use of seatbelts has codes of never (1) through always (5). This item is available for the BRFSS in 2006 and 2008 but not for the BRFSS in 2007 or the LACHS.

Several sociodemographic variables are available from the surveys. Education is coded to have four values: less than high school, high school degree, some college or technical school, and college degree. Race has six categories—non-Hispanic White, non-Hispanic Black, Hispanic, Asian/Pacific Islander, Native American, and other or multiracial – and whites serve as the reference category. Married persons and members of an umarried couple are coded one and others coded zero. Household income has eight categories in the BRFSS and seven categories in the LACHS that are recoded to their midpoints in thousands of dollars, with the top category of $75,000 and over coded as 90 on the basis of figures in Hout (2004). The 2006 and 2007 income figures are adjusted by the consumer price index to be in 2008 dollars. It is also possible to adjust for the number of adults living in a household, but this measure did not change the results and is not used in the final analyses. Employment has three categories (with the first treated as the referent): 1) employed for wages, self-employed, or going to school, 2) not working (homemaker, retired), and 3) unable to work (unemployed, disabled).

Estimation

While some analyses rely on descriptive statistics and correlations, examining the influence of the socioeconomic determinants of disaster preparedness and health behaviors requires multivariate analyses. All the analyses use weights provided by the

BRFSS and LACHS to adjust for non-response within each state and county and obtain representative estimates of the state or county parameters.

For the multivariate analysis, several estimation techniques (linear regression; binary, ordered, multinomial logistic regression; and Poisson regression) could be used to fit the particular distribution of each outcome variable. For ease of comparison, however, use of ordinary least squares (OLS) for all the measures of health behaviors proves helpful and gives results that differ little from the other techniques. In addition, OLS has the benefit of allowing comparisons of standardized coefficients across outcome variables in different units. Standardization of coefficients from categorical models, particularly in relation to the outcome variables, presents major problems (Long 1997). More important, techniques for the categorical variables have a limitation in making comparisons across variables. By holding the error variance to be fixed (at 3.29 for logistic regression) for all outcome variables, the slope estimates are greatly affected by the degree of unobserved heterogeneity (Mood 2010), which likely varies across outcome variables and biases comparisons of logged odds and odds ratio across models. Although not ideal, OLS estimates have advantages in comparing effects.

Results

Means and Correlations

Table 1 lists descriptive statistics for the health-behavior and sociodemographic measures. The BRFSS sample sizes for the states with preparedness data range from 16,565 to 27,845. The smaller numbers for safe alcohol use and seatbelt use result from the lack of data on the measures in 2007. For the LACHS, the sample sizes, which are highest for preparedness (6262) and lowest for body weight (5666), vary because of higher non-response for some items.

The preparedness scale has an arbitrary mean of zero, making it useful for comparing relative levels of preparedness across groups rather than evaluating the degree of preparedness. But some of the preparedness component variables are more revealing. In the BRFSS, 26 percent say they are very prepared, 54 percent say they are somewhat prepared, and 20 percent say they are not prepared. Concerning more specific actions, only about 28 percent say they have an evacuation plan. About 15 percent say they do all six activities included in the preparedness inventory. Another 33 percent say they do five of the six and 29 percent say they do four of the five. Only 22 percent say they do less than four of the five.

For the LACHS, the component variables have both similarities and differences from those for the BRFSS. Only 6 percent say they are completely prepared to deal with a catastrophic disaster and 19 percent say they are mostly prepared. The combined categories with 25 percent match the figures for the top category in the BRFSS data. The

Table 1. Descriptive Statistics: BRFSS 2006-2008 and LACHS 2005

BRFSS Health Behaviors	N	Mean	SD	Min	Max
Preparedness Scale	27845	0.00	1.00	-3.83	2.76
Non-Smoker	27755	0.77	0.42	0	1
Recent Exercise	27815	0.76	0.43	0	1
Normal or Overweight	26647	0.68	0.47	0	1
Medical Checkup	27251	3.51	0.91	1	4
Safe Alcohol Use	16565	2.80	0.52	0	3
Seatbelt Use	16937	4.69	0.82	1	5
Sociodemographic	**N**	**Mean**	**SD**	**Min**	**Max**
Male	27845	0.49	0.50	0	1
Age	27845	43.83	10.74	26	64
White	27679	0.70	0.46	0	1
Black	27679	0.19	0.39	0	1
Hispanic	27679	0.05	0.21	0	1
Asian American	27679	0.02	0.13	0	1
Native American	27679	0.01	0.11	0	1
Mixed Race	27679	0.03	0.17	0	1
Married	27745	0.72	0.45	0	1
Education <12	27817	0.08	0.28	0	1
Education 12	27817	0.28	0.45	0	1
Education 11-15	27817	0.27	0.44	0	1
Education 16+	27817	0.37	0.48	0	1
Income	25114	57.69	29.46	5	96
Working	27780	0.74	0.44	0	1
Not Working	27780	0.14	0.34	0	1
Unable to Work	27780	0.12	0.33	0	1

LACHS Health Behaviors	N	Mean	SD	Min	Max
Preparedness Scale	6262	0.00	1.00	-3.29	1.42
Non-Smoker	6243	0.82	0.38	0	1
Physical Activity Scale	6204	4.05	2.12	1	7
Normal or Overweight	5666	0.75	0.43	0	1
Regular Medical Care	6233	0.81	0.39	0	1
Safe Alcohol Use	6143	2.76	0.57	0	3
Sociodemographic	**N**	**Mean**	**SD**	**Min**	**Max**
Male	6263	0.49	0.50	0	1
Age	6263	43.82	10.57	26	64
White	6196	0.39	0.49	0	1
Black	6196	0.09	0.28	0	1
Hispanic	6196	0.41	0.49	0	1
Asian American	6196	0.10	0.30	0	1
Native American	6196	0.01	0.07	0	1
Mixed Race	6196	0.01	0.11	0	1
Married	6225	0.60	0.49	0	1
Education <12	6246	0.20	0.40	0	1
Education 12	6246	0.19	0.39	0	1
Education 11-15	6246	0.25	0.43	0	1
Education 16+	6246	0.37	0.48	0	1
Income	5869	43.89	31.44	5	90
Working	6240	0.71	0.46	0	1
Not Working	6240	0.16	0.37	0	1
Unable to Work	6240	0.13	0.34	0	1

modal category of somewhat prepared includes 41 percent, but 18 and 17 percent, respectively, say they are not very prepared or not at all prepared. While viewing themselves as more often not very or not prepared, LA County residents are more likely than others to have an evacuation plan—43 percent say they have one compared to 28 percent of the BRFSS respondents. About 28 percent say they have done all six of the preparation activities, again higher than the BRFSS. The higher risks in LA County may lead to lower self-perceived preparedness despite better compliance with recommendations.

Among the health behaviors, levels are high for seatbelt use, exercise, and regular checkups. For several measures, LA County residents report better health behaviors. About 82 percent do not smoke, compared to 77 for the BRFSS sample, and 75 percent fall into the normal or overweight category, compared to 68 percent in the BRFSS. Most of the other measures are not directly comparable across the BRFSS and LACHS, but both samples generally show high levels of exercise, safe alcohol use, and regular medical care or checkups. Note that the BRFSS health variables are available for all the other states, but the means for all cases differ little from those in Table 1. The preparedness subsample has about 2 percentage points more smokers and obese persons, and 7 percentage points more have had a recent medical checkup. Otherwise, the means differ only slightly.

Table 1 also lists descriptive statistics for the socioeconomic variables. The LACHS data include many more Hispanics and Asian Americans, fewer Whites and married persons, and more persons with less than a high school degree.

Table 2 begins the analysis of the relationships among the health behaviors. The bivariate correlations (with pairwise deletion of missing data) are generally weak. The preparedness scale correlates most highly with exercise (r = .10 and .15) and regular checkups or medical care (r =.08 and .17). Other than for seatbelt use in the BRFSS (r = .07) and safe alcohol use in the LACHS (r = .08), the correlations are close to zero. The partial correlations, which control for the sociodemographic variables, are only slightly smaller than the bivariate correlations and show much the same pattern of relationships.

Correlations of the non-preparedness health behaviors with one another are no larger, with one exception—safe alcohol use is correlated r = .14 and .18 with non-smoking. When using the full sample rather than the sample of states with disaster preparedness items, the correlations among the health behaviors differ little from those reported in the table. Overall, then, the health behaviors are largely independent of one another and of preparedness.

Some checks on the correlations involve use of dichotomies rather than scales for disaster preparedness and some of the other health behaviors. For example, dichotomous measures of disaster preparedness can successively classify larger percentages of respondents as prepared. I created several dummy variables that contrast the top quintile of preparedness with others, the top 40 percent with others, and the top 60 percent with

others. The dummy variables are comparable to several other dichotomous measures of health behavior and provide checks on the assumption that preparedness represents an interval scale. In fact, given the loss of information, the dichotomous measures had lower correlations than the scale. In addition, I checked the correlations of the component items of the disaster preparedness scale with the health behaviors. On average, these correlations are weaker than the ones for the scale.

Table 2. Bivariate and Partial Correlations of Disaster Preparedness with Health Behaviors

BRFSS	Prep. Scale	Non-Smoker	Recent Exercise	Normal Weight	Medical Checkup	Safe Alcohol	Seatbelt Use	Partial Prep. Scale
Preparedness Scale	1.00							
Non-Smoker	0.00	1.00						-0.02
Recent Exercise	0.10	0.12	1.00					0.08
Normal or Overweight	0.04	-0.02	0.12	1.00				0.02
Medical Checkup	0.08	0.11	0.00	-0.05	1.00			0.08
Safe Alcohol Use	0.03	0.14	-0.04	-0.04	0.11	1.00		0.05
Seatbelt Use	0.07	0.06	0.04	0.09	0.13	0.07	1.00	0.07

LACHS	Prep. Scale	Non-Smoker	Physical Activity	Normal Weight	Regular Care	Safe Alcohol		Prep. Scale
Preparedness Scale	1.00							
Non-Smoker	0.04	1.00						0.02
Physical Activity Scale	0.15	0.06	1.00					0.14
Normal or Overweight	0.03	0.00	0.08	1.00				-0.01
Regular Care	0.17	0.04	0.02	-0.02	1.00			0.10
Safe Alcohol Use	0.08	0.18	-0.02	-0.03	0.06	1.00		0.09

[a] Pairwise deletion of missing data

Regression

The next step is to compare the determinants of the health behaviors. Although the health behaviors have only weak to modest associations with one another, the existing overlap may come largely from similarities in the social determinants. To test for this possibility, Table 3 presents regression models for the seven outcome measures, the same set of sociodemographic determinants, and the same sets of cases. To ease comparisons

across outcomes in different units of measurement, the table presents standardized regression coefficients. Although not listed in the table, the BRFSS models include fixed-effect dummy variables to control for unmeasured state and year influences.

Emergency preparedness is predicted by being male, older, married, and in a high income category. Education shows some nonlinearity in its relationship: Disaster preparedness is higher among those with a high school degree, some college, or a college degree or with less than a high school degree. Additional tests of significance (with Bonferroni adjusted *p* values) show that preparedness among college graduates in the BRFSS but not in the LACHS is lower than among those with some college. Some minorities have lower preparedness, while employment status has inconsistent effects. Consider next the similarities and differences in effects across models for the health behaviors.

Gender. Despite higher preparedness, men are less likely than women to be non-smokers, get regular checkups, have a regular source of medical care, consume alcohol in safe ways, and use seatbelts. In most ways, women are less prone to risky behavior. That these patterns do not hold for disaster preparedness reflects its special characteristics.

Age. Older persons are more likely to prepare for disasters as well as get more checkups, use alcohol safely, and use seatbelts. Other aspects of health such as exercising regularly and maintaining normal weight are, not surprisingly, associated with younger ages.

Race. Blacks, Hispanics, and Asian Americans have slightly lower scores on disaster preparedness in the BRFSS. However, they show less consistent disadvantages in health behaviors. Blacks and LA County Hispanics are less likely to be normal or overweight, and LA County Asian Americans are less likely to exercise. More positively, Hispanics smoke less and blacks in the BRFSS get more regular care. Note that the apparent advantaged position of minorities on some health behaviors stems from the controls for SES. Without controls, minorities tend to smoke more and less often have regular sources of care (Los Angeles County Department of Public Health 2007b).

Education. The greater disaster preparedness among high school than college graduates contrasts with results for most of the health behaviors. For the BRFSS, college graduates are more likely than other education groups to not smoke, exercise, and use seat belts. The LACHS shows weaker effects of education, but having a regular source of care is the only outcome that, like disaster preparedness, shows curvilinear effects of education.

Income. Richer households are more likely to prepare for disasters. The same relationship holds for most health behaviors. Higher income is associated with non-smoking, exercise, and regular checkups or care.

Overall, then, the socioeconomic determinants do not reveal a clear pattern of results that generalizes from disaster preparedness to health behaviors. In some cases, characteristics that increase disaster preparedness increase health behaviors, but there are

Table 3. Standardized Multiple Regression Coefficients for Models of Disaster Preparedness and Health Behaviors

	BRFSS 2006, 2007, and 2008 (N = 23491)										BRFSS 2006 and 2008 (N = 15037)					
Predictors	Prep. Scale		Non-Smoker		Recent Exercise		Normal or Overweight		Regular Checkup		Prep. Scale		Safe Alcohol		Seatbelt Use	
Male	0.08	***	-0.03	**	0.04	***	-0.01		-0.13	***	0.09	***	-0.17	***	-0.14	***
Age	0.10	***	0.05	***	-0.08	***	-0.03	*	0.12	***	0.10	***	0.08	***	0.09	***
Black	-0.06	***	0.09	***	-0.01		-0.09	***	0.14	***	-0.06	**	0.03		0.01	
Hispanic	-0.04	**	0.03	*	-0.01		0.00		0.04	**	-0.06	**	-0.01		0.02	
Asian American	-0.06	***	0.00		-0.03		0.03	*	0.04	***	-0.06	***	0.05	***	0.04	***
Native American	0.02		-0.02		0.00		-0.02		0.02		0.02		0.01		-0.03	
Mixed Race	0.00		0.00		0.00		0.00		0.01		0.01		0.00		-0.01	
Married	0.04	**	0.08	***	0.00		-0.01		0.03	*	0.03	*	0.08	***	0.00	
Education 12	0.10	***	0.12	***	0.08	**	0.01		0.00		0.14	***	0.04		0.07	
Education 13-15	0.09	***	0.18	***	0.12	***	0.01		0.04		0.13	***	0.03		0.10	*
Education 16+	0.07	*	0.31	***	0.21	***	0.06	*	0.05		0.11	**	0.05		0.17	***
Income	0.11	***	0.10	***	0.12	***	0.06	***	0.09	***	0.10	***	-0.05	*	0.04	
Not Working	0.04	***	0.01		0.02	*	0.01		0.02	*	0.04	***	0.00		0.03	**
Unable to Work	-0.02		-0.05	***	-0.08	***	-0.03	*	0.03	*	-0.01		0.05	**	0.01	

* p < .05 ** p < .01 *** p < .001

Table 3. Standardized Multiple Regression Coefficients for Models of Disaster Preparedness and Health Behaviors (continued)

LACHS 2005 (N = 5079)

Predictors	Prep. Scale		Non-Smoker		Physical Activity		Normal or Overweight		Regular Care		Safe Alcohol	
Male	0.04	*	-0.12	***	0.07	***	0.01		-0.10	***	-0.17	***
Age	0.16	***	-0.01		-0.10	***	-0.08	***	0.14	***	0.11	***
Black	0.01		-0.03		-0.03		-0.06	**	0.03	*	0.04	*
Hispanic	0.00		0.15	***	-0.02		-0.09	***	-0.01		0.06	**
Asian American	-0.08	***	0.01		-0.11	***	0.05	***	-0.04	*	0.05	**
Native American	0.00		0.00		-0.02		-0.03	*	0.02	*	0.02	**
Mixed Race	0.04	***	0.02		0.01		0.01		-0.01		0.01	
Married	0.10	***	0.06	**	-0.02		0.02		0.01		0.08	***
Education 12	0.08	**	-0.03		0.02		-0.01		0.08	**	0.03	
Education 13-15	0.13	***	0.02		0.04		-0.02		0.08	**	0.05	*
Education 16+	0.12	***	0.10	**	0.04		0.05		0.06		0.06	*
Income	0.18	***	0.10	***	0.07	**	0.03		0.23	***	-0.01	
Not Working	0.01		0.03	*	0.00		-0.01		0.01		0.05	***
Unable to Work	-0.05	**	-0.03		-0.08	***	-0.04	*	0.00		0.03	

* p < .05 ** p < .01 *** p < .001

cases in which the demographic variables have effects that are nil or (mostly for males) in the opposite direction for health behaviors.

Discussion

Tierney (2007) argues that disaster research has developed in ways that have weakened its ties with sociology and should strengthen ties to related fields such as risk and social inequality. This study represents one such effort. It explicitly links disaster preparedness to health behaviors commonly studied in the sociology of health and more widely in the fields of epidemiology and public health. It further draws out theoretical arguments that, based on the common influence of SES, predict similarities among the behaviors. And it offers one of the first efforts to systematically test the arguments with data from two surveys, one in selected U.S. states and one in Los Angeles County.

The results reveal a few similarities of disaster preparedness with health behaviors but many more differences. The similarities show in positive correlations of disaster preparedness with the measures of health behavior and in correlations of modest size with regular medical care and physical activity. The differences show in near zero correlations with non-smoking, safe alcohol use, proper weight, and seatbelt use. The socioeconomic determinants of disaster preparedness likewise show a few similarities with the determinants of health behaviors but many more differences. Similarities appear in consistent positive associations of most health behaviors with income. Education has benefits for health behavior but less consistently than for income. Gender, age, and race, however, differ in their influences on disaster preparedness and health behaviors.

Evaluating how well the results support arguments for similarities in disaster preparedness and health behaviors depends on the criteria one uses to determine the strength of the relationships. The enormous variation across individuals in actions and attitudes means that survey-based relationships are typically small or modest in size. Still, none of the reported correlation or standardized regression coefficients reaches .2, and only a few exceed .1. Rather, most coefficients fall below .1 and offer only weak evidence of similarity. There is overlap among the health behaviors and their determinants, but stronger and more consistent relationships are needed to support a theory of well-defined health lifestyles.

Consider some of the differences that emerge from the analysis. The disaster preparedness measure is higher among men and those with less than college education, while health behavior measures are generally more common among women and those with college education. Men tend to take the lead in disaster preparedness, but for health behaviors, women and the highest educated have better profiles. Perhaps traditional male norms encourage readiness for and leadership during instances of physical danger, such as in emergencies. Traditional female roles, in contrast, involve routine actions to promote safety such as seatbelt use and regular checkups. Thus, some groups do better on

disaster preparedness than the health behaviors, and some do better on the health behaviors than disaster preparedness.

Despite some modest insights that come from comparisons of disaster preparedness with health behaviors, the results here provide little justification for joining the two separate research literatures. Research on disaster preparedness and other public health issues appear distinct in most ways. However, it does make sense to take some more tentative and incremental steps toward linking the two literatures. Surveys on disaster preparedness could easily add a few questions on smoking, health care, and exercise; health surveys could likewise add a few questions on disaster preparedness. Even if disaster preparedness and health behavior are not part of a common health lifestyle, better understanding of the differences may provide insights into both.

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