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Determinants of Oil-spill Cleanup Participation following the Deepwater Horizon Oil Spill

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Abstract

Background—On April 20, 2010, the *Deepwater Horizon* oil rig exploded, spilling over 4.9 million barrels of oil in the Gulf of Mexico over an 87-day period and developing into a long-term environmental disaster that affected people living in Gulf Coast states. Engagement of community members in recovery efforts is important for mitigating adverse effects of disasters and accelerating the rebuilding process for impacted communities; however, few studies have explored factors that determine participation in oil spill cleanups.

Methods—We analyzed data from the Gulf States Population Survey (GSPS) to study the determinants of participating in the *Deepwater Horizon* Oil Spill cleanup. The GSPS was a random-digit dialing survey conducted on 38,361 adults in counties and parishes in Alabama, Florida, Louisiana, and Mississippi impacted by the oil spill. Using survey estimation to account for the complex survey design, we estimated the probability of cleanup participation and used logistic regression to examine the association between sociodemographic factors and cleanup participation.

Results—Approximately 4.7% of residents in affected Gulf communities participated in the cleanup. Most participants were young, men, non-Hispanic white, and employed. Living in an affected coastal county was associated with higher odds of participation (unadjusted odds ratio [OR]: 1.69; 95% confidence interval [CI]: 1.28–2.24), as was having excellent or very good physical health (OR: 2.05; 95% CI: 1.11–3.81). Older persons were less likely to participate in the cleanup (OR for 65+ age group vs. 18–24 age group: 0.14; 95% CI: 0.05–0.36).

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Declaration of Conflicting Interests

The authors have no conflicts of interest to declare.

Conclusions—Understanding the demographics of cleanup participants may help inform civilian recruitment for future oil spill responses.

Keywords

Deepwater Horizon; Gulf States Population Survey; oil spill cleanup; community participation; Gulf Coast

1. Introduction

On April 20, 2010, the British Petroleum (BP)-operated *Deepwater Horizon* oil rig exploded in what became an environmental catastrophe, killing 11 rig workers and spilling over 4.9 million barrels of oil in the Gulf of Mexico over an 87-day period (Goldstein, Osofsky, & Lichtveld, 2011; National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011). A disaster of such magnitude has detrimental effects on people living in both directly and indirectly affected areas, as this disaster impacted coastal communities as well as members of the response and cleanup efforts who were not exclusively local residents (Aguilera, Mendez, Pasaro, & Laffon, 2010; Laffon, Pasaro, & Valdiglesias, 2016). Research on the health effects of the oil spill identified rises in reports of depression (Buttke, Vagi, Bayleyegn, et al., 2012; Buttke, Vagi, Schnall, et al., 2012; Fan, Prescott, Zhao, Gotway, & Galea, 2015; Kwok, McGrath, et al., 2017; Lowe et al., 2016; Osofsky, Osofsky, & Hansel, 2011; Rung et al., 2016). Also, increases in anxiety were found among persons residing in places impacted by the oil spill (Buttke, Vagi, Bayleyegn, et al., 2012; Buttke, Vagi, Schnall, et al., 2012; Gould, Teich, Pemberton, Pierannunzi, & Larson, 2015; Lowe et al., 2016; Osofsky et al., 2011). Other studies examining the effects of the spill reported a greater occurrence of physical distress (Buttke, Vagi, Bayleyegn, et al., 2012; Buttke, Vagi, Schnall, et al., 2012; Fan et al., 2015; Gam et al., 2018; McGowan et al., 2017; Peres et al., 2016).

Engagement of community members in recovery efforts is important for mitigating some of the adverse environmental and health effects of disasters, like oil spills (Twigg & Mosel, 2017; Walker et al., 2013; Whittaker, McLennan, & Handmer, 2015). Much of the disaster-related research on civilian participation examines the role of communities in disaster preparedness as opposed to response and recovery efforts; however, including communities in both the planning process and implementation of recovery efforts is important for mitigating the effects of disasters (Khan, 2008; Walker, Pavia, Bostrom, Leschine, & Starbird, 2015). Research has shown that increasing community participation at the local level by recruiting civilians for response efforts improves the rebuilding process for that community (Rowlands, 2013; Walker et al., 2013; Walker et al., 2015). Studies have also found that participation in disaster response and recovery programs have beneficial impacts on mental and behavioral health of volunteers (Fukasawa, Suzuki, Obara, & Kim, 2015; Picou, 2009; Wyles, Pahl, Holland, & Thompson, 2017). Increasing civilian participation in disaster recovery activities, such as oil spill cleanups, can likely not only accelerate a community's disaster response and recovery phase but have a beneficial effect on the well-being of community members involved in such efforts as well.

Various sociodemographic aspects determine whether and which civilians take part in disaster response and recovery tasks. There are barriers to civilian participation in disaster response and recovery activities, such as a lack of resources or social connectedness (Twigg & Mosel, 2017). Factors that enable such participation include proximity to the affected area, social and cultural capital, past experience with disasters, resources, and awareness of disaster risks (Fernandez, Barbera, & van Dorp, 2006; Smith, Hamerton, Hunt, & Sargisson, 2016; Twigg & Mosel, 2017). Demographic characteristics, such as gender and age, also influence civilian activeness in disaster recovery (Twigg & Mosel, 2017). Despite existing research, the knowledge base on which civilians participate in recovery activities is limited and varies by disaster event, requiring studies to investigate characteristics of civilian responders for specific disasters (Twigg & Mosel, 2017; Whittaker et al., 2015).

The cleanup efforts of the *Deepwater Horizon* oil spill involved controlled burning and releasing approximately two million gallons of dispersant chemicals to aid in the disintegration of the crude oil (Biello, 2010; National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011; Repanich, 2010). Thousands of workers and volunteers were also employed to assist with cleanup tasks along the coastlines of affected Gulf States (Kwok, Engel, et al., 2017; National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011). Persons opting to aid in the cleanup of the oil spill were not necessarily representative of all individuals in the Gulf communities that were impacted, and it is important to identify the subgroups of people who participated in the cleanup, especially to improve participant recruitment for future oil spills. Moreover, very few studies have explored factors that determine participation in oil spill cleanups, hence motivating this study. The objective of this study was to estimate the probability of participating in the oil spill cleanup and determine the factors associated with cleanup participation for the *Deepwater Horizon* oil spill.

2. Methods

2.1. Data source

Data utilized for this study originated from the Gulf States Population Survey (GSPS) (Centers for Disease Control and Prevention). The GSPS was a random-digit dialing survey conducted by the Centers for Disease Control and Prevention (CDC) in partnership with state and local health departments and the Substance Abuse and Mental Health Services Administration (SAMHSA) from December 2010 to December 2011 (Centers for Disease Control and Prevention, 2013). The GSPS involved surveying persons who were 18 years of age or older and resided in counties and parishes impacted by the 2010 *Deepwater Horizon* oil spill in Alabama, Florida, Louisiana, and Mississippi (Centers for Disease Control and Prevention, 2013). It was implemented to assess the physical, behavioral, and mental health of the population in the Gulf region in order to evaluate the need for behavioral and mental health services and coordinate the provision of such services in areas affected by the oil spill (Centers for Disease Control and Prevention, 2013).

In total, 38,361 individuals completed interviews that were included in the GSPS. Initially, only persons living in one of 25 coastal counties and parishes within a 32-mile area that prohibited fishing due to the oil spill were included in the study sample (Centers for Disease

Control and Prevention, 2013). In May 2011, the CDC began to recruit residents of counties and parishes in the affected Gulf States that were further from the oil spill into the study sample (Centers for Disease Control and Prevention, 2013). This was to enable comparison of results between the coastal and non-coastal counties and parishes. A total of 27,947 respondents lived in one of the 25 coastal counties and parishes, while the remaining 10,414 respondents resided in non-coastal areas of the Gulf States. Also, in May 2011, the CDC allowed cell phone respondents to be included in the study sample and began to administer a Spanish version of the survey (Centers for Disease Control and Prevention, 2013). Landline-based interviews were completed by 32,813 individuals, and 5,548 individuals used cell phones to complete the GSPS survey. Persons opting to participate in the survey in Spanish accounted for 122 of the completed interviews.

The GSPS was conducted using a complex survey design, incorporating cluster methodology and disproportionate stratified sampling. Due to this, the GSPS data were weighted using similar procedures as the Behavioral Risk Factor Surveillance system (Centers for Disease Control and Prevention, 2013). In a two-step process, GSPS data were weighted to adjusted U.S. census county-level estimates, using information on age, race, sex, geographic stratification, and phone ownership (Centers for Disease Control and Prevention, 2013). All data collected for the GSPS were de-identified, aggregated, and publicly accessible.

2.2. Study measures

Demographic measures—Self-reported demographic information included age, gender, race/ethnicity, marital status, county type of residence, and state of residence. Age was categorized into groups: 1824 years, 25–34 years, 35–44 years, 45–54 years, 55–64 years, and 65 years and older. Participants reported their gender as male or female. For this study, race/ethnicity was classified as non-Hispanic White, non-Hispanic Black, Hispanic, or other. Other included persons reporting to be non-Hispanic American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, and other races or ethnicities. Current marital status reported by participants was categorized as married or not married. County type of residence was categorized as either residing in a coastal county or non-coastal county. Participants also reported their state of residence being either Alabama, Florida, Louisiana, or Mississippi.

Socioeconomic and health status measures—Self-reported information on socioeconomic and health status included employment status before the oil spill, household income, general health status, physical health status, and mental health status. Employment status was classified as employed, not employed, or other, which included being a homemaker, student, or retiree. Pre-oil spill employment was selected for inclusion rather than post-oil spill employment to ensure the temporality of this exposure variable and that cleanup participation did not influence a participant's employment status (i.e. participating in the cleanup in order to earn an income). Estimated annual household income in 2010 was categorized into groups: Less than $25,000, $25,000-$49,999, $50,000-$74,999, and $75,000 or more. The variables for general health status, physical health status, and mental

health status were categorized into the following groups based on health status reported at the time of interview: poor or fair; good; very good or excellent.

Outcome measures—Primarily, the outcome of interest was whether a survey respondent participated in the *Deepwater Horizon* oil spill cleanup activities. This variable was categorized as yes or no. Information on the position a respondent held during cleanup activities was collected and categorized as volunteer or paid. Information on the specific type of cleanup activity in which a respondent participated was also collected, which included helping with beach or marsh cleanup, bird or wildlife cleanup, boom deployment and recovery or off-shore skimming, decontamination or waste stream management, well-head cleanup or controlled burning, administrative, logistical, or medical support, and other cleanup activities. In any analysis investigating specific cleanup activities, activity participation was not analyzed mutually exclusively, allowing for full incorporation of the data on participants who performed multiple cleanup tasks.

2.3. Statistical analysis

In brief, summary statistics were generated using survey estimation methods, and logistic regression models were used to examine demographic, socioeconomic, and health factors associated with participating in the *Deepwater Horizon* oil spill cleanup. Using survey estimation, we estimated the probability of participating in the oil spill cleanup among the overall population of the four affected Gulf States and among demographic, socioeconomic, and health status subpopulations. Further, we estimated the probability of participating in specific cleanup activities among the overall population of cleanup participants and by whether a participant was a volunteer or was paid for cleanup services.

In addition, we used univariate logistic regression models to examine whether demographic, socioeconomic, and health factors were associated with oil spill cleanup participation. Univariate logistic regression methods were primarily emphasized for this study, as this research is exploratory in nature. As very few studies have been conducted to explore factors that are associated with participation in oil spill cleanups, there is not enough existing research to conduct a study more analytic in scope. Therefore, we elected to conduct this exploratory study to investigate whether certain factors are associated with cleanup participation of oil spills, and the findings from this study can be used to inform future analytic epidemiologic research in this area.

Using subpopulation estimation in the univariate logistic regression models, we also investigated whether these factors were associated with cleanup participation by specific Gulf State and residential county type (coastal versus non-coastal). Statistical significance for all logistic regression analyses was set to an alpha level of 0.05. Missing data were handled by multiple imputation using chained equations with 65 imputed datasets (Azur, Stuart, Frangakis, & Leaf, 2011). All analyses were performed using Stata SE 15.1 (StataCorp LP, College Station, Texas, USA).

3. Results

3.1. Descriptive characteristics of cleanup participation

Characteristics of the overall population of the four affected Gulf States, stratified by cleanup participation, are provided in Table 1. Approximately 4.7% (95% confidence interval [CI]: 3.7–5.6%) of residents in these states participated in the oil spill cleanup. Participants in cleanup efforts were mostly younger in age, as many were either aged 18–24 years (22.3%; 95% CI: 11.5–33.0%) or 25–34 years (26.8%; 95% CI: 17.7–35.9%). A majority of cleanup participants were men (56.2%; 95% CI: 45.8–66.7%) and of non-Hispanic white race (68.0%; 95% CI: 57.0–78.9%). Participants in the cleanup reported high employment rates prior to the occurrence of the oil spill (64.0%; 95% CI: 52.8–75.1%), and nearly one-third were students, retirees, or homemakers (27.5%; 95% CI: 16.3–38.6%). A majority of participants reported being from non-coastal areas (82.6%; 95% CI: 78.8–86.5%). Most of the participants were from the state of Florida (70.6%; 95% CI: 63.7–77.6%) followed by Louisiana (13.0%; 95% CI: 9.916.2%), Alabama (11.8%; 95% CI: 7.2–16.4%), and Mississippi (4.5%; 95% CI: 2.5–6.6%). Many reported very good or excellent overall health at the time of the survey (64.7%; 95%: 54.275.3%). See Table 1 for further descriptive information.

3.2. Characteristics of cleanup participation by task

Results describing cleanup participation by specific cleanup task are presented in Table 2. Most of the cleanup participants were volunteers (70.4%; 95% CI: 61.9–78.9%), and 29.6% (95% CI: 21.1–38.1%) were paid for their cleanup services. Most of the cleanup participants assisted with beach or marsh cleanup (71.3%; 95% CI: 61.9–80.7%), and nearly one-third participated in bird or wildlife cleanup activities (29.6%; 95% CI: 19.6–39.7%). Approximately one of four participants assisted with either decontamination or waste stream management tasks (24.9%; 95% CI: 14.8–35.0%) or administrative, logistical, or medical support (25.7%; 95% CI: 17.0–34.3%). Very few cleanup participants assisted with well-head cleanup or controlled burning (3.7%; 95% CI: 0.62–6.8%). There were differences by whether a cleanup participant volunteered or was paid for assisting with the oil spill cleanup. Of the volunteer cleanup participants, 72.8% (95% CI: 67.4–78.3%) participated in beach or marsh cleanup, and 52.0% (95% CI: 42.9–61.2%) of the paid participants participated in beach or marsh cleanup. Of the volunteer participants, 7.1% (95% CI: 4.2–10.0%) assisted with boom deployment and recovery or off-shore skimming compared to 36.7% (95% CI: 28.2–45.1%) of paid participants. Of the cleanup participants who volunteered, 12.2% (95% CI: 7.6–16.8%) aided with decontamination or waste stream management, while 39.5% (95% CI: 29.6–49.4%) of the paid cleanup participants helped with decontamination or waste stream management. See Table 2 for additional differences by participant type.

3.3. Factors associated with cleanup participation

Table 3 presents the findings from the univariate logistic regression analyses. Results indicated that living in an affected coastal county on the Gulf was associated with higher odds of participating in the oil spill cleanup (unadjusted odds ratio [OR]: 1.69; 95% CI: 1.28–2.24), as was having excellent or very good physical health (OR: 2.05; 95% CI: 1.11–3.81). Older adults, or those aged 65 years and older, were less likely to participate in the

cleanup (OR vs. 18–24 age group: 0.14; 95% CI: 0.05–0.36). This finding was similar to results for middle-aged participants between 45–54 years (OR vs. 18–24 age group: 0.37; 95% CI: 0.17–0.77).

Findings from additional logistic regression analyses stratified by Gulf State are provided in Table A1 in the Appendix. In Alabama, men had higher odds of cleanup participation (OR: 3.01; 95% CI: 1.50–6.05). Similar results were found in Louisiana (OR: 2.40; 95% CI: 1.74–3.32). Also, in both Alabama and Louisiana, black residents had lower odds of participating, and residents who were not employed or were a student, homemaker, or retiree were less likely to participate in the cleanup. For the state of Florida, persons not currently married were more likely to participate in the cleanup (OR: 1.95; 95% CI: 1.05–3.63). Having an annual income of $75,000 or more was associated with higher odds of oil spill cleanup participation in Mississippi (OR: 4.82; 95% CI: 1.87–12.44). Such findings were found in Alabama and Louisiana as well. See Table A1 for complete logistic regression results by state. Additional logistic regression results by county type of residence can be found in Table A2 in the Appendix.

Based upon previous research and results from the univariate regression analyses in this current study, a post-hoc secondary analysis was conducted using multivariable regression models to further examine the initial exploratory findings reported in Table 3 and Tables A1 and A2 in the Appendix. Prior studies on the *Deepwater Horizon* oil spill have found differences in cleanup participants and non-participants by age, sex, race and ethnicity, educational attainment, income, and residence (Kwok, Engel, et al., 2017). Thus, age group, gender, race/ethnicity, household income, county type of residence, and state of residence were included in the multivariable regression model. Employment status was included in the model as a proxy for educational attainment based on Kwok et al.'s work, and physical health status was also included based upon multiple statistically significant results from each of this study's univariate regression analyses, as presented in Tables 3, A1, and A2. Table 4 presents the findings from the post-hoc analysis, confirming the negative associations between older age and cleanup participation among persons aged 45–54 years (adjusted odds ratio [AOR] vs. 18–24 age group: 0.36; 95% CI: 0.17–0.76) and persons aged 65 years and older (AOR vs. 18–24 age group: 0.13; 95% CI: 0.05–0.35). Similarly to the univariate analyses, living in an affected coastal county was associated with a greater likelihood of participating in the oil spill cleanup (AOR: 2.21; 95% CI: 1.77–2.76). In addition, being from the state of Florida was associated with higher odds of participation in the cleanup (AOR: 1.81; 95% CI: 1.07–3.08). See Table 4 for further results from the post-hoc multivariable analysis.

4. Discussion

Engaging local communities in the cleanup of oil spills can benefit the well-being of participating residents and expedite the post-oil spill recovery phase, such as through providing job training and additional income to civilians or building resilience in affected communities (Gulf Research Program, 2015; Walker et al., 2013; Walker et al., 2015). However, little research has been conducted to investigate the factors associated with whether a resident participates in the cleanup of an oil spill. In this large sample of persons

residing in Gulf States affected by the *Deepwater Horizon* oil spill, we found associations between certain demographic, socioeconomic, and health-related factors and oil spill cleanup participation. While overall cleanup participation was low amongst the populations of the affected Gulf States, results indicated that persons who were younger, male, white, employed before the oil spill, and single were highly represented among cleanup participants. Having a very good or excellent health status was also a characteristic of participating in the cleanup, and nearly seven out of ten participants were volunteers. It was also evident that most cleanup participants assisted with less dangerous cleanup tasks, as well-head cleanup or controlled burning was the least participated task.

Findings from the logistic regression analyses indicated that living in areas closest to and directly impacted by the oil spill was associated with participating in the cleanup of the spill. This was confirmed when conducting the post-hoc multivariable regression analysis. This was also found when analyzing data from each of the four affected Gulf States, potentially signifying that those residing in affected communities may be most easily mobilized and motivated to improve their communities and assist with disaster recovery from an oil spill. Having very good or excellent physical health was positively associated with cleanup participation, and persons of older ages had lower odds of participating in the oil spill cleanup. This association between older age and cleanup participation was also validated in the multivariable analysis. In addition, factors associated with cleanup participation differed by county type of residence. As shown in Table A2 of the Appendix, having a high income and good, very good, or excellent health as well as being younger in age, male, employed, and not of black race were associated with greater odds of cleanup participation among individuals from coastal counties; however, of these factors, only younger age had such an association with cleanup among those with residence in non-coastal counties.

When stratifying by Gulf State in the logistic regression, we found that sociodemographic factors of cleanup participants varied by state. While being of young age and not currently married were associated with participating in cleanup efforts among Floridians, having a high income was associated with participation among Mississippians. Among Alabamians and Louisianians, being male and having employment, a high income, and optimal physical health were associated with participating in the oil spill cleanup. Also, among Louisianians, younger age and very good or excellent general health were associated with cleanup participation. Further, being of black race was associated with lower participation in the cleanup among Alabamians and Louisianians.

These are important findings because they signify that persons who may be members of vulnerable populations based on age, race and ethnicity, gender, or socioeconomic status are less likely to be involved in the oil spill cleanup, which is problematic in that these persons face unique risks and adverse health effects, and experiencing an oil spill may only exacerbate their present circumstances. Participation in post-disaster cleanups aids in community resilience, and it should be determined how to best engage these groups in cleanup activities to improve the resilience of whole communities (Gulf Research Program, 2015; Walker et al., 2013; Walker et al., 2015). Past research has found that community participation in disaster response mostly involves and engages those who are local elites,

excluding vulnerable groups (Khan, 2008), which is consistent with our study findings as well.

Thus, populations who are already more likely to experience adverse effects of disasters are also disproportionately not participating in oil spill cleanups nor being exposed to the potentially mitigating effects that derive from increased social engagement. Such groups are also not being exposed to the potential income and job training to be gained from paid cleanup work, and these disparities may be addressed with more community-wide recruitment of civilians for future oil spill response efforts. In fact, there have been appeals in regards to this issue to view vulnerable groups in terms of their resilience, social capital, and capacity to contribute to disaster recovery efforts and less in terms of their vulnerability status (Khan, 2008). Moreover, future studies should explore why vulnerable populations had lower participation in oil spill recovery activities.

Limitations of this study should be considered. First, self-reported data can be biased if any GSPS respondents exhibited recall bias or answered some questions with dishonesty due to social desirability bias. Since some of the GSPS data were collected within a year of the oil spill, and all data were collected within two years of the spill, recall bias may be minimized. We also incorporated variables for health status at the time of survey as opposed to self-reported health status before the oil spill to minimize recall bias for this highly time-varying measure. Moreover, the CDC's interview procedures were standardized; the surveys were not conducted in-person, and interviewers received sufficient training in administering the GSPS survey, thus minimizing the likelihood of social desirability bias and data collection inconsistencies.

Second, our study investigates civilian participation in initial cleanup activities only. The cleanup of the oil spill continued up until April 2014 and, likely, some time afterwards (Ramseur, 2015). Since the GSPS survey was conducted between December 2010 and December 2011 with a focus on initial cleanup efforts, the survey did not capture cleanup participants in later years. Recruitment efforts for an oil spill cleanup in later years may be very different from those for initial cleanup activities, and future research should investigate these potential differences. In addition, cleanup participants who originated from non-coastal areas may be systematically different from the initial survey population because they were not recruited until May 2011 as opposed to the December 2010 recruitment start for the initial population. Similarly, cell phone respondents and Spanish language respondents may also be systematically different from the initial GSPS population due to the recruitment lag. While it is difficult to determine whether the participation of the non-coastal, cell phone, and Spanish language respondents is biased based on the current data, future studies should intend to collect this missing information and further examine the potential impact of the recruitment lags.

Lastly, our study was based on a cross-sectional design, and our study objectives were exploratory in nature, inhibiting us from drawing causal conclusions between participating in the cleanup of the *Deepwater Horizon* oil spill and demographic, socioeconomic, and health-related factors. With this, it is important to note that since our analyses in this exploratory study were primarily univariate, future research may wish to conduct more

robust multivariable logistic regression analyses and interaction tests to determine whether there are further nuances to participating in oil spill cleanups.

This research is distinct from previous work and provides additional insight into the determinants of civilian participation in oil spill cleanups due to the inclusion of a broader study population. In our study, we compared persons participating in the cleanup to those who did not among all persons residing in Alabama, Florida, Louisiana, and Mississippi. Prior studies have compared cleanup participants to those who did not participate among a cohort of workers trained for the oil spill cleanup (Kwok, Engel, et al., 2017), not among the whole populations living in the affected states, as in our study. While the population included in our study coincides with the work of Kwok and colleagues in regards to race and ethnicity, our study population is younger and wealthier as well as has lower proportions of male and married cleanup participants than Kwok et al.'s study population, contributing to differences in our findings compared to Kwok and colleagues' results (Kwok, Engel, et al., 2017). Largely, since our study examined cleanup participation of persons residing in Alabama, Florida, Louisiana, and Mississippi, not solely persons trained to assist with the oil spill cleanup, our results further the work done by previous researchers and can be utilized to inform civilian participation in oil spill cleanups for a more extensive population.

In closing, to our knowledge, few studies have specifically explored the factors that are associated with civilian participation in an oil spill cleanup, adding to the novelty of this work. Our study found that those who are young, white, male, and single were most likely to participate in the *Deepwater Horizon* oil spill cleanup. This research provides further evidence for recognizing that persons who are of high socioeconomic status and of great health have a higher probability of participating in oil spill cleanups. Our results may also be useful for identifying and targeting populations that are not greatly represented among the cleanup participants in efforts to include persons from vulnerable, hard-to-reach groups and diversify oil spill response efforts. In closing, understanding the demographics of cleanup participants may help inform how best to recruit community members for future oil spill responses.

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APPENDIX A

Table A1.

Factors associated with participation in the *Deepwater Horizon* oil spill cleanup by state of residence.

	Alabama			Florida			Louisiana			Mississippi		
Factor	**OR**	**95% CI**	***P* value**	**OR**	**95% CI**	***P* value**	**OR**	**95% CI**	***P* value**	**OR**	**95% CI**	***P* value**
Age group												
18–24	Ref			Ref			Ref			Ref		
25–34	0.57	0.20, 1.64	0.293	0.71	0.28, 1.83	0.477	0.85	0.52, 1.38	0.517	2.70	0.65, 11.24	0.172
35–44	1.53	0.50, 4.66	0.456	0.34	0.12, 0.98	0.045*	0.66	0.41, 1.08	0.096	2.69	0.62, 11.79	0.188
45–54	0.86	0.28, 2.67	0.798	0.27	0.10, 0.75	0.012*	0.50	0.29, 0.86	0.012*	1.34	0.38, 4.80	0.650
55–64	0.66	0.13, 3.42	0.623	0.41	0.15, 1.16	0.093	0.31	0.18, 0.53	<0.001*	0.97	0.27, 3.52	0.967
65 +	0.36	0.08, 1.63	0.186	0.11	0.03, 0.37	<0.001*	0.12	0.06, 0.23	<0.001*	0.39	0.10, 1.60	0.191
Gender												
Female	Ref			Ref			Ref			Ref		
Male	3.01	1.50, 6.05	0.002*	1.11	0.61,2.01	0.730	2.40	1.74, 3.32	<0.001*	1.67	0.73, 3.85	0.228
Race/Ethnicity												
White, Not Hispanic	Ref			Ref			Ref			Ref		
Black, Not Hispanic	0.22	0.07, 0.67	0.008*	1.27	0.47, 3.38	0.636	0.58	0.38, 0.89	0.013*	0.52	0.16, 1.65	0.266
Hispanic	2.88	0.50, 16.69	0.237	0.49	0.17, 1.42	0.191	1.28	0.65, 2.54	0.476	0.26	0.06, 1.14	0.075
Other	3.53	1.14, 10.90	0.028*	0.83	0.27, 2.58	0.747	1.59	0.92, 2.75	0.094	1.23	0.39, 3.88	0.724
Employment status												
Employed	Ref			Ref			Ref			Ref		
Not employed	0.24	0.08, 0.74	0.013*	0.66	0.24, 1.82	0.422	0.33	0.18, 0.59	<0.001*	1.10	0.30, 3.96	0.889
Other	0.36	0.15, 0.85	0.021*	0.87	0.42, 1.79	0.698	0.44	0.29, 0.65	<0.001*	0.46	0.20, 1.08	0.076
Household income												
Less than $25,000	Ref			Ref			Ref			Ref		
$25,000 – $49,999	1.05	0.35, 3.12	0.931	1.39	0.58, 3.34	0.463	1.75	1.08, 2.86	0.024*	2.81	1.04, 7.60	0.042*
$50,000 – $74,999	1.30	0.36, 4.62	0.689	1.31	0.49, 3.49	0.593	1.11	0.65, 1.89	0.700	2.85	0.69, 11.71	0.146
$75,000 or more	4.38	1.68, 11.46	0.003*	0.84	0.36, 1.98	0.688	2.28	1.48, 3.50	<0.001*	4.82	1.87, 12.44	0.001*
Marital status												
Married	Ref			Ref			Ref			Ref		
Not married	0.57	0.28, 1.18	0.133	1.95	1.05, 3.63	0.034*	1.01	0.75, 1.38	0.928	0.79	0.33, 1.87	0.587
County type												
Non-coastal	Ref			Ref			Ref			Ref		
Coastal	3.71	2.01,6.84	<0.001*	1.49	1.03, 2.16	0.036*	1.86	1.35, 2.58	<0.001*	7.63	3.33, 17.45	<0.001*
General health status												
Poor or fair	Ref			Ref			Ref			Ref		
Good	1.44	0.47, 4.44	0.524	0.85	0.30, 2.39	0.752	1.08	0.67, 1.74	0.760	0.78	0.18, 3.40	0.744
Excellent or very good	2.59	0.90, 7.44	0.078	1.19	0.51,2.81	0.687	2.27	1.49, 3.46	<0.001*	1.68	0.39, 7.31	0.489
Physical health status												
Poor or fair	Ref			Ref			Ref			Ref		
Good	1.19	0.45, 3.16	0.730	1.83	0.68, 4.93	0.233	1.58	0.99, 2.53	0.055	0.34	0.10, 1.14	0.080

	Alabama			Florida			Louisiana			Mississippi		
Factor	**OR**	**95% CI**	***P* value**	**OR**	**95% CI**	***P* value**	**OR**	**95% CI**	***P* value**	**OR**	**95% CI**	***P* value**
Excellent or very good	2.99	1.14, 7.88	0.026*	2.06	0.83, 5.08	0.118	2.39	1.60, 3.57	<0.001*	0.73	0.22, 2.35	0.592
Mental health status												
Poor or fair	Ref			Ref			Ref			Ref		
Good	0.78	0.25, 2.46	0.670	0.33	0.11, 1.04	0.058	1.27	0.70, 2.32	0.427	0.98	0.11,8.61	0.982
Excellent or very good	1.36	0.48, 3.86	0.563	0.60	0.23, 1.61	0.315	1.59	0.97, 2.60	0.065	1.45	0.23, 8.90	0.690

Data source: CDC, Gulf States Population Survey, 2010–2011.

** P* value < 0.05

OR: odds ratio

CI: confidence interval

Table A2.

Factors associated with participation in the *Deepwater Horizon* oil spill cleanup by residential county type.

	Coastal county			Non-coastal county		
Factor	**OR**	**95% CI**	***P* value**	**OR**	**95% CI**	***P* value**
Age group						
18–24	Ref			Ref		
25–34	0.68	0.47, 0.98	0.040*	0.77	0.33, 1.82	0.550
35–44	0.57	0.39, 0.82	0.003*	0.50	0.20, 1.22	0.129
45–54	0.43	0.30, 0.62	<0.001*	0.35	0.14, 0.86	0.022*
55–64	0.33	0.22, 0.49	<0.001*	0.46	0.18, 1.20	0.114
65 +	0.14	0.09, 0.23	<0.001*	0.14	0.04, 0.42	0.001*
Gender						
Female	Ref			Ref		
Male	2.01	1.62, 2.48	<0.001*	1.30	0.77, 2.19	0.318
Race/Ethnicity						
White, Not Hispanic	Ref			Ref		
Black, Not Hispanic	0.70	0.51,0.96	0.026*	0.82	0.34, 1.97	0.654
Hispanic	1.13	0.68, 1.87	0.632	0.63	0.23, 1.70	0.359
Other	1.38	0.94, 2.04	0.099	1.10	0.42, 2.86	0.850
Employment status						
Employed	Ref			Ref		
Not employed	0.64	0.43, 0.97	0.034*	0.53	0.21, 1.33	0.179
Other	0.56	0.43, 0.73	<0.001*	0.75	0.39, 1.46	0.400
Household income						
Less than $25,000	Ref			Ref		
$25,000 – $49,999	1.22	0.89, 1.67	0.220	1.52	0.68, 3.43	0.311
$50,000 – $74,999	1.04	0.73, 1.48	0.821	1.46	0.59, 3.64	0.414
$75,000 or more	1.53	1.14, 2.06	0.005*	1.32	0.64, 2.73	0.450
Marital status						

	Coastal county			Non-coastal county		
Factor	**OR**	**95% CI**	***P* value**	**OR**	**95% CI**	***P* value**
Married	Ref			Ref		
Not married	1.09	0.88, 1.35	0.415	1.57	0.93, 2.66	0.091
State of residence						
Alabama	Ref			Ref		
Florida	0.78	0.57, 1.07	0.125	1.95	1.02, 3.72	0.043*
Louisiana	0.58	0.43, 0.78	<0.001*	1.15	0.61,2.17	0.655
Mississippi	0.97	0.67, 1.41	0.876	0.47	0.18, 1.24	0.126
General health status						
Poor or fair	Ref			Ref		
Good	1.56	1.10, 2.22	0.013*	0.85	0.33, 2.16	0.729
Excellent or very good	2.15	1.57, 2.94	<0.001*	1.36	0.64, 2.89	0.426
Physical health status						
Poor or fair	Ref			Ref		
Good	1.61	1.17, 2.21	0.004*	1.59	0.68, 3.70	0.282
Excellent or very good	2.27	1.72, 2.99	<0.001*	2.02	0.96, 4.26	0.063
Mental health status						
Poor or fair	Ref			Ref		
Good	1.68	1.11,2.56	0.015*	0.36	0.13, 0.98	0.046*
Excellent or very good	1.77	1.24, 2.52	0.002*	0.69	0.29, 1.62	0.393

Data source: CDC, Gulf States Population Survey, 2010–2011.

*P value < 0.05

OR: odds ratio

CI: confidence interval

REFERENCES

Aguilera F, Mendez J, Pasaro E, & Laffon B (2010). Review on the effects of exposure to spilled oils on human health. Journal of Applied Toxicology, 30(4), 291–301. doi:10.1002/jat.1521 [PubMed: 20499335]

Azur MJ, Stuart EA, Frangakis C, & Leaf PJ (2011). Multiple imputation by chained equations: what is it and how does it work? International Journal of Methods in Psychiatric Research, 20(1), 40–49. doi:10.1002/mpr.329 [PubMed: 21499542]

Biello D (2010). Is Using Dispersants on the BP Gulf Oil Spill Fighting Pollution with Pollution? Scientific American. Retrieved from http://www.scientificamerican.com/article/is-using-dispersants-fighting-pollution-with-pollution/

Buttke D, Vagi S, Bayleyegn T, Sircar K, Strine T, Morrison M, … Wolkin A (2012). Mental health needs assessment after the Gulf Coast oil spill-Alabama and Mississippi, 2010. Prehospital and Disaster Medicine, 27(5), 401–408. doi:10.1017/S1049023X12001100 [PubMed: 22985680]

Buttke D, Vagi S, Schnall A, Bayleyegn T, Morrison M, Allen M, & Wolkin A (2012). Community Assessment for Public Health Emergency Response (CASPER) one year following the Gulf Coast oil spill: Alabama and Mississippi, 2011. Prehospital and Disaster Medicine, 27(6), 496–502. doi: 10.1017/S1049023X12001380 [PubMed: 23010443]

Centers for Disease Control and Prevention. Gulf States Population Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2010 - 2011.

Centers for Disease Control and Prevention. (2013). Gulf States Population Survey Data User Guide. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2010 - 2011.

Fan AZ, Prescott MR, Zhao G, Gotway CA, & Galea S (2015). Individual and community-level determinants of mental and physical health after the deepwater horizon oil spill: findings from the gulf States population survey. Journal of Behavioral Health Services and Research, 42(1), 23–41. doi:10.1007/s11414-014-9418-7 [PubMed: 25124651]

Fernandez LS, Barbera JA, & van Dorp JR (2006). Spontaneous volunteer response to disasters: The benefits and consequences of good intentions. Journal of Emergency Management, 4(5), 57–68.

Fukasawa M, Suzuki Y, Obara A, & Kim Y (2015). Relationships between mental health distress and work-related factors among prefectural public servants two months after the Great East Japan Earthquake. International Journal of Behavioral Medicine, 22(1), 1–10. doi:10.1007/s12529-014-9392-8 [PubMed: 24585179]

Gam KB, Kwok RK, Engel LS, Curry MD, Stewart PA, Stenzel MR, … Sandler DP (2018). Lung Function in Oil Spill Response Workers 1–3 Years After the Deepwater Horizon Disaster. Epidemiology, 29(3), 315–322. doi:10.1097/EDE.0000000000000808 [PubMed: 29381492]

Goldstein BD, Osofsky HJ, & Lichtveld MY (2011). The Gulf oil spill. New England Journal of Medicine, 364(14), 1334–1348. doi:10.1056/NEJMra1007197 [PubMed: 21470011]

Gould DW, Teich JL, Pemberton MR, Pierannunzi C, & Larson S (2015). Behavioral health in the gulf coast region following the Deepwater Horizon oil spill: findings from two federal surveys. Journal of Behavioral Health Services and Research, 42(1), 6–22. doi:10.1007/s11414-014-9441-8 [PubMed: 25339594]

Gulf Research Program. (2015). Opportunities for the Gulf Research Program: Community Resilience and Health: Summary of a Workshop. Washington, DC: The National Academies Press.

Khan S (2008). Community Participation in Disaster Rehabilitation and Recovery. Birmingham, United Kingdom: Governance and Social Development Resource Center.

Kwok RK, Engel LS, Miller AK, Blair A, Curry MD, Jackson WB, … GuLF Study Research Team. (2017). The GuLF STUDY: A Prospective Study of Persons Involved in the Deepwater Horizon Oil Spill Response and Clean-Up. Environmental Health Perspectives, 125(4), 570–578. doi:10.1289/EHP715 [PubMed: 28362265]

Kwok RK, McGrath JA, Lowe SR, Engel LS, Jackson WBN, Curry MD, … Sandler DP (2017). Mental health indicators associated with oil spill response and clean-up: cross-sectional analysis of the GuLF STUDY cohort. Lancet Public Health, 2(12), e560–e567. doi:10.1016/S2468-2667(17)30194-9 [PubMed: 29253441]

Laffon B, Pasaro E, & Valdiglesias V (2016). Effects of exposure to oil spills on human health: Updated review. Journal of Toxicology and Environmental Health. Part B: Critical Reviews, 19(3–4), 105–128. doi:10.1080/10937404.2016.1168730 [PubMed: 27221976]

Lowe SR, Kwok RK, Payne J, Engel LS, Galea S, & Sandler DP (2016). Why Does Disaster Recovery Work Influence Mental Health?: Pathways through Physical Health and Household Income. American Journal of Community Psychology, 58(3–4), 354–364. doi:10.1002/ajcp.12091 [PubMed: 27704561]

McGowan CJ, Kwok RK, Engel LS, Stenzel MR, Stewart PA, & Sandler DP (2017). Respiratory, Dermal, and Eye Irritation Symptoms Associated with Corexit EC9527A/EC9500A following the Deepwater Horizon Oil Spill: Findings from the GuLF STUDY. Environmental Health Perspectives, 125(9), 097015. doi:10.1289/EHP1677 [PubMed: 28934097]

National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling. (2011). Deep Water: The Gulf Oil Disaster and the Future of Offshore Drilling.

Osofsky HJ, Osofsky JD, & Hansel TC (2011). Deepwater horizon oil spill: mental health effects on residents in heavily affected areas. Disaster Medicine and Public Health Preparedness, 5(4), 280–286. doi:10.1001/dmp.2011.85 [PubMed: 22146666]

Peres LC, Trapido E, Rung AL, Harrington DJ, Oral E, Fang Z, … Peters ES (2016). The Deepwater Horizon Oil Spill and Physical Health among Adult Women in Southern Louisiana: The Women and Their Children's Health (WaTCH) Study. Environmental Health Perspectives, 124(8), 1208–1213. doi:10.1289/ehp.1510348 [PubMed: 26794669]

Picou JS (2009). Disaster Recovery as Translational Applied Sociology: Transforming Chronic Community Distress. Humboldt Journal of Social Relations, 32(1), 123–157.

Ramseur JL (2015). Deepwater Horizon Oil Spill: Recent Activities and Ongoing Developments. Washington D.C.: U.S. Congressional Research Service.

Repanich J (2010). The Deepwater Horizon Spill by the Numbers. Popular Mechanics. Retrieved from https://www.popularmechanics.com/science/energy/a6032/bp-oil-spill-statistics/

Rowlands A (2013). Disaster Recovery Management in Australia and the Contribution of Social Work. Journal of Social Work in Disability & Rehabilitation, 12, 19–38. [PubMed: 23679802]

Rung AL, Gaston S, Oral E, Robinson WT, Fontham E, Harrington DJ, … Peters, E. S. (2016). Depression, Mental Distress, and Domestic Conflict among Louisiana Women Exposed to the Deepwater Horizon Oil Spill in the WaTCH Study. Environmental Health Perspectives, 124(9), 1429–1435. doi:10.1289/EHP167 [PubMed: 27164620]

Smith K, Hamerton H, Hunt S, & Sargisson RJ (2016). Local volunteers respond to the Rena oil spill in Maketu, New Zealand. Kōtuitui: New Zealand Journal of Social Sciences Online, 11(1), 1–10. doi:10.1080/1177083X.2015.1009474

Twigg J, & Mosel I (2017). Emergent groups and spontaneous volunteers in urban disaster response. Environment and Urbanization, 29(2), 443–458.

Walker AH, Boyd J, McPeek M, Scholz D, Joeckel J, & Ott G (2013). Community Engagement Guidance for Oil and HNS Incidents Prepared for Pembrokeshire County Emergency Management, UK and funded by the European Regional Development Fund. SEA Consulting Group, Cape Chalres, VA USA, 181 pages.

Walker AH, Pavia R, Bostrom A, Leschine TM, & Starbird K (2015). Communication Practices for Oil Spills: Stakeholder Engagement During Preparedness and Response. Human and Ecological Risk Assessment: An International Journal, 21(3), 667–690. doi:10.1080/10807039.2014.947869

Whittaker J, McLennan B, & Handmer J (2015). A review of informal volunteerism in emergencies and disasters: Definition, opportunities and challenges. International Journal of Disaster Risk Reduction, 13, 358–368.

Wyles KJ, Pahl S, Holland M, & Thompson RC (2017). Can Beach Cleans Do More Than Clean-Up Litter? Comparing Beach Cleans to Other Coastal Activities. Environment and Behavior, 49(5), 509–535. doi: 10.1177/0013916516649412 [PubMed: 28546642]

Highlights

- An estimated 4.7% of residents in impacted areas participated in the cleanup of the *Deepwater Horizon* oil spill
- Most cleanup participants were young, male, white, single, and employed before the oil spill, highlighting the need to target members of underrepresented groups for cleanups
- Approximately seven out of ten participants were volunteers, with most persons assisting with less dangerous cleanup tasks
- Having optimal physical health and living in an affected coastal county were associated with cleanup participation, while older persons were less likely to participate

Table 1.

Demographic, socioeconomic, and health characteristics of participation in the *Deepwater Horizon* oil spill cleanup.

Characteristic	Total		Participated		Did not participate	
	%	95% CI	%	95% CI	%	95% CI
Total Population			4.7	3.7, 5.6	95.3	94.4, 96.3
Age group						
18–24	11.4	9.9, 12.8	22.3	11.5, 33.0	10.8	9.4, 12.3
25–34	17.5	15.9, 19.1	26.8	17.7, 35.9	17.1	15.4, 18.7
35–44	16.4	14.8, 18.1	17.3	10.1,24.4	16.4	14.7, 18.1
45–54	17.8	16.2, 19.4	13.6	7.7, 19.5	18.0	16.3, 19.7
55–64	14.8	13.5, 16.2	13.6	6.8, 20.5	14.9	13.5, 16.3
65 +	22.1	20.2, 23.9	6.5	1.7, 11.3	22.8	20.9, 24.7
Gender						
Male	48.3	46.1,50.5	56.2	45.8, 66.7	47.9	45.7, 50.1
Female	51.7	49.5, 53.9	43.8	33.3, 54.2	52.1	49.9, 54.3
Race/Ethnicity						
White, Not Hispanic	63.2	61.0, 65.5	68.0	57.0, 78.9	63.0	60.7, 65.3
Black, Not Hispanic	19.1	17.4, 20.7	16.6	6.8, 26.5	19.2	17.5, 20.9
Hispanic	11.4	9.5, 13.3	7.9	1.3, 14.5	11.6	9.6, 13.5
Other	6.3	4.9, 7.7	7.5	2.2, 12.9	6.3	4.8, 7.7
Employment status						
Employed	54.6	52.5, 56.8	64.0	52.8, 75.1	54.2	51.9, 56.4
Not employed	12.9	11.5, 14.4	8.5	2.8, 14.3	13.2	11.7, 14.6
Other	32.4	30.4, 34.5	27.5	16.3, 38.6	32.7	30.6, 34.8
Household income						
Less than $25,000	33.0	30.8, 35.1	26.1	15.5, 36.6	33.3	31.1,35.5
$25,000 – $49,999	24.7	22.8, 26.7	28.3	17.6, 39.0	24.5	22.6, 26.5
$50,000 – $74,999	16.5	14.7, 18.3	17.9	8.2, 27.5	16.4	14.6, 18.2
$75,000 or more	25.8	23.8, 27.8	27.8	18.9, 36.6	25.7	23.7, 27.7
Marital status						
Married	52.0	49.8, 54.1	42.8	32.4, 53.1	52.4	50.2, 54.6
Not married	48.0	45.9, 50.2	57.2	46.9, 67.6	47.6	45.4, 49.8
County type						
Coastal	11.3	11.0, 11.6	17.4	13.5, 21.2	11.0	10.7, 11.4
Non-coastal	88.7	88.4, 89.0	82.6	78.8, 86.5	89.0	88.6, 89.3
State of residence						
Alabama	15.2	14.5, 15.8	11.8	7.2, 16.4	15.3	14.7, 16.0
Florida	61.5	60.6, 62.5	70.6	63.7, 77.6	61.1	60.0, 62.1
Louisiana	14.1	13.8, 14.5	13.0	9.9, 16.2	14.2	13.8, 14.6
Mississippi	9.2	8.7, 9.6	4.5	2.5, 6.6	9.4	8.9, 9.9
General health status						

Characteristic	Total		Participated		Did not participate	
	%	95% CI	%	95% CI	%	95% CI
Poor or fair	15.8	14.2, 17.4	13.0	5.8, 20.3	16.0	14.3, 17.6
Good	28.9	27.0, 30.9	22.2	12.7, 31.8	29.3	27.2, 31.3
Excellent or very good	55.2	53.1,57.4	64.7	54.2, 75.3	54.8	52.5, 57.0
Physical health status						
Poor or fair	19.0	17.3, 20.7	11.4	5.4, 17.4	19.4	17.6, 21.1
Good	29.8	27.8, 31.8	27.6	17.7, 37.6	29.9	27.8, 32.0
Excellent or very good	51.2	49.0, 53.4	61.0	50.5, 71.4	50.7	48.5, 52.9
Mental health status						
Poor or fair	10.9	9.4, 12.4	14.8	5.3, 24.3	10.7	9.2, 12.2
Good	21.7	19.9, 23.5	13.9	7.8, 19.9	22.1	20.3, 23.9
Excellent or very good	67.4	65.3, 69.5	71.4	61.3, 81.4	67.2	65.1,69.3

Data source: CDC, Gulf States Population Survey, 2010–2011.

CI: confidence interval

Table 2.

Activity characteristics of participation in the *Deepwater Horizon* oil spill cleanup.

	Any participation		Volunteer participation		Paid participation	
	%	95% CI	%	95% CI	%	95% CI
Total Population			70.4	61.9, 78.9	29.6	21.1,38.1
Activity						
Beach or marsh cleanup	71.3	61.9, 80.7	72.8	67.4, 78.3	52.0	42.9, 61.2
Bird or wildlife cleanup	29.6	19.6, 39.7	29.8	23.1,36.5	15.9	10.3, 21.6
Boom deployment and recovery or off-shore skimming	14.4	9.0, 19.8	7.1	4.2, 10.0	36.7	28.2, 45.1
Decontamination or waste stream management	24.9	14.8, 35.0	12.2	7.6, 16.8	39.5	29.6, 49.4
Well-head cleanup or controlled burning	3.7	0.62, 6.8	2.8	0.38, 5.3	6.6	2.0, 11.1
Administrative, logistical, or medical support	25.7	17.0, 34.3	21.0	15.4, 26.7	38.4	28.8, 48.0
Other	15.6	8.5, 22.7	16.0	11.5, 20.4	21.1	14.4, 27.9

Data source: CDC, Gulf States Population Survey, 2010–2011.

Note. Activity participation is not mutually exclusive, thus column percentages do not sum to 100%.

CI: confidence interval

Table 3.

Unadjusted estimates of factors associated with participation in the *Deepwater Horizon* oil spill cleanup.

Factor	OR	95% CI	*P* value
Age group			
18–24			Ref
25–34	0.76	0.37, 1.57	0.461
35–44	0.51	0.24, 1.08	0.080
45–54	0.37	0.17, 0.77	0.009 *
55–64	0.44	0.20, 1.00	0.050
65 +	0.14	0.05, 0.36	<0.001 *
Gender			
Female			Ref
Male	1.40	0.90, 2.16	0.132
Race/Ethnicity			
White, Not Hispanic			Ref
Black, Not Hispanic	0.80	0.39, 1.65	0.549
Hispanic	0.62	0.25, 1.53	0.304
Other	1.11	0.50, 2.50	0.795
Employment status			
Employed			Ref
Not employed	0.55	0.26, 1.15	0.112
Other	0.71	0.40, 1.26	0.246
Household income			
Less than $25,000			Ref
$25,000 – $49,999	1.47	0.75, 2.92	0.264
$50,000 – $74,999	1.39	0.64, 3.03	0.406
$75,000 or more	1.38	0.77, 2.50	0.281
Marital status			
Married			Ref
Not married	1.47	0.96, 2.28	0.079
County type			
Non-coastal			Ref
Coastal	1.69	1.28, 2.24	<0.001 *
State of residence			
Alabama			Ref
Florida	1.51	0.92, 2.46	0.103
Louisiana	1.20	0.79, 1.82	0.402
Mississippi	0.63	0.35, 1.12	0.113
General health status			
Poor or fair			Ref
Good	0.93	0.42, 2.06	0.861
Excellent or very good	1.45	0.75, 2.81	0.268

Factor	OR	95% CI	*P* value
Physical health status			
Poor or fair			Ref
Good	1.58	0.78, 3.20	0.206
Excellent or very good	2.05	1.11, 3.81	0.022 *
Mental health status			
Poor or fair			Ref
Good	0.45	0.19, 1.09	0.076
Excellent or very good	0.77	0.35, 1.68	0.512

Data source: CDC, Gulf States Population Survey, 2010–2011.

* *P* value < 0.05

OR: odds ratio

CI: confidence interval

Table 4.

Adjusted estimates of factors associated with participation in the *Deepwater Horizon* oil spill cleanup.

Factor	AOR	95% CI	*P* value
Age group			
18–24			Ref
25–34	0.71	0.35, 1.46	0.355
35–44	0.50	0.24, 1.06	0.070
45–54	0.36	0.17, 0.76	0.007*
55–64	0.45	0.19, 1.06	0.067
65 +	0.13	0.05, 0.35	<0.001*
Gender			
Female			Ref
Male	1.29	0.83, 2.01	0.253
Race/Ethnicity			
White, Not Hispanic			Ref
Black, Not Hispanic	0.88	0.41, 1.88	0.741
Hispanic	0.55	0.22, 1.41	0.215
Other	1.08	0.47, 2.44	0.862
Employment status			
Employed			Ref
Not employed	0.78	0.32, 1.93	0.598
Other	0.99	0.54, 1.81	0.971
Household income			
Less than $25,000			Ref
$25,000 – $49,999	1.30	0.61, 2.77	0.498
$50,000 – $74,999	1.11	0.45, 2.75	0.815
$75,000 or more	1.13	0.56, 2.29	0.729
County type			
Non-coastal			Ref
Coastal	2.21	1.77, 2.76	<0.001*
State of residence			
Alabama			Ref
Florida	1.81	1.07, 3.08	0.028*
Louisiana	0.89	0.58, 1.34	0.566
Mississippi	0.60	0.33, 1.09	0.092
Physical health status			
Poor or fair			Ref
Good	1.26	0.57, 2.77	0.565
Excellent or very good	1.50	0.71, 3.19	0.289

Data source: CDC, Gulf States Population Survey, 2010–2011.

*P value < 0.05

AOR: adjusted odds ratio

CI: confidence interval