Framing Peak Petroleum as a Public Health Problem: Audience Research and Participatory Engagement in the United States

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Between December 2009 and January 2010, we conducted a nationally representative telephone survey of US adults (n = 1001; completion rate = 52.9%) to explore perceptions of risks associated with peak petroleum. We asked respondents to assess the likelihood that oil prices would triple over the next 5 years and then to estimate the economic and health consequences of that event. Nearly half (48%) indicated that oil prices were likely to triple, causing harm to human health; an additional 16% said dramatic price increases were unlikely but would harm health if they did occur. A large minority (44%) said sharp increases in oil prices would be ''very harmful'' to health. Respondents who self-identified as very conservative and those who were strongly dismissive of climate change were the respondents most likely to perceive very harmful health consequences. (*Am J Public Health.* 2011;101:1620–1626. doi:10.2105/AJPH.2011.300230)

Over the next few decades as society passes the point of peak production of petroleum, human health and well-being are likely to face significant risks. Despite declines in global production rates, global demand for petroleum is likely to grow. As a consequence, the price of petroleum—and overall energy costs—will begin to steadily increase over the long term. Even aggressive initiatives aimed at improving energy efficiency and developing alternative energy technologies are unlikely to reduce US dependence on petroleum for several decades.[1]

As shown by articles in this special issue of the *American Journal of Public Health*, the projected public health impacts of peak petroleum include an increase in the costs of medical supplies and pharmaceuticals; a rise in the costs of transportation for patients, health care providers, and medical suppliers; an increase in the operating costs of hospitals and health care facilities; and a rise in the costs of food, home heating, and home cooling.[2] The economic stress caused by peak petroleum—including loss of personal income, unemployment, a decline in consumer confidence, and the increased cost of goods and services—is also likely to negatively affect public health and well-being. Those most vulnerable to these impacts will be young children, the elderly, people with chronic conditions, and people living in poverty.[3–5] Peak petroleum may benefit human health and society in certain ways as well. For example, a dramatic increase in the cost of gasoline would likely decrease automobile use and increase rates of walking, biking, and public transportation while reducing emissions of greenhouse gases and other pollutants that trigger asthma and respiratory problems.[3–5]

In the face of uncertainty, however, the public health community cannot afford to simply react to the advent of peak petroleum; we must start to anticipate, prepare for, and co-manage the likely health threats. As with climate change, experts and their organizations must plan for and mobilize societal actions that mitigate (i.e., delay) the advent of peak petroleum while also pursuing adaptation strategies that protect the public against negative health consequences when peak petroleum does occur. This planning needs to be informed by careful audience research that assesses where different segments of the public currently stand in terms of awareness and perceptions of the issue. To these ends, we analyze nationally representative public opinion data that we collected between December 2009 and January 2010 and discuss the factors that likely influence public perceptions of peak petroleum. Given the political context for energy policy, we focus specifically on differences in perceptions by ideology and by views of climate change.

MANY AMERICANS ANTICIPATE SEVERE ENERGY SHORTAGES

Compared with such issues as climate change, peak petroleum has received very limited attention. A review of coverage by national agenda-setting news outlets from 2005 through 2010 found 4 articles focused on peak petroleum appearing in the *New York Times*, 5 articles in *Business Week*, 4 articles in *The Economist*, and 3 articles in the *Washington Post*. In addition, none of these articles mentioned public health–related impacts; they instead focused exclusively on economic, political, or national security implications. Given the limited media focus on the expert debate over peak petroleum, even if past surveys had asked specifically about perceptions of peak petroleum or peak oil, public responses would likely reflect a high proportion of "don't know" responses, refusals to answer, or nonattitudes.[6] Moreover, there have yet to be any substantial recent academic investigations assessing public perceptions on the topic.

However, several recent polling questions have measured public views about energy availability, access, and cost. Gallup surveys conducted in 2007 and 2008, for example, indicated at the time that 53% (2007) and 62% (2008) of Americans believed that the United States would face a severe energy shortage in the next 5 years and that 43% (2007) and 47% (2008) of Americans worried "a great deal" about the availability and affordability of energy.[7] In April 2010 when Gallup queried Americans again, the proportion of Americans anticipating a severe energy shortage had declined to 43%. When asked in January 2010 to rate the top policy priorities for Congress and the president, 49% rated energy as a top priority, placing the issue at about midtier among 20 issues queried.[8] These survey findings suggest that although peak petroleum may not yet be a leading priority for Americans,

large proportions of the public do express concern over the availability and cost of energy. Going back several decades, these perceptions appear to shift, likely in relation to the performance of the economy and the cost of gas.[9]

FACTORS SHAPING PUBLIC PERCEPTIONS

As is the case with climate change, the public may be predisposed to ignore or discount messages about possible risks of peak petroleum as a result of various background factors, including the complexity of the issue, the nature of its impacts, and people's value predispositions.[10] Research suggests that some people (i.e., "hierarchists") may reject the risks of peak petroleum and policy actions proposed to address it because they threaten hierarchists' belief and trust in the status quo—which, in this case, consists of a petroleum-based economy and lifestyle. Alternatively, "individualists" may judge policy actions as unfair restrictions on markets and individual rights. Because these value constructs tend to correlate with conservative ideology, it is likely that conservatives might be the most dismissive of the risks of peak petroleum and policies to address them.[11,12]

However, cognitive research over the past several decades has shown that the ways in which experts, policymakers, and journalists frame an issue (i.e., how they mentally organize and discuss the issue's central ideas) greatly influence how the public understands the nature of the problem, the personal relevance or societal importance of the problem, who or what people see as being responsible for the problem, and what they feel should be done to address the problem.[13–16]

For peak petroleum, the limited amount of news coverage has been framed almost exclusively around economic or national security implications. When public debates over issues such as peak petroleum are in their early stages of development, the more time that passes with just 1 or 2 frames applied to the issue the more likely it is that these frames will become "locked in," deflecting focus from other considerations such as public health. The locking-in of a frame has a lasting and powerful feedback effect on news coverage, policy decisions, and public perceptions.[17]

Therefore, framing peak petroleum in terms of public health may help promote appropriate policy decisions over the long term and may lead to better-informed individual decisions among members of the public. This redefinition is likely to draw connections to problems that are already familiar or salient, such as access to and cost of health care or the price of food and home heating while also establishing linkages to more general economic impacts. In addition, suggesting a frame such as public health, which resonates with people's broadly shared values, is particularly useful because the frame can help people ground their understanding of an issue in the context of their previously existing, carefully considered, and deeply held belief systems and motivations.[18]

There likely are important parallels between the framing of peak petroleum and the framing of climate change. Research involving in-depth interviews with representative segments of Americans finds that when climate change is introduced as a health problem, followed by information about specific mitigation-related policy actions that benefit health and well-being, a broad cross-section of respondents find this reframing of the issue to be compelling and respond positively to it, including conservative-leaning segments otherwise dismissive of climate science.[19]

Fundamental to the success of any engagement method or initiative is an understanding of the intended audience so that communication is responsive to an audience's situation, concerns, and values. To this end, in light of the dearth of public opinion research on awareness and perceptions of peak petroleum, we collected primary data in the context of a previously funded and scheduled survey of the US adult population.

METHODS

From December 24, 2009, through January 3, 2010, we conducted a nationally representative survey of American adults by using KnowledgePanel, an online panel operated by Knowledge Networks. KnowledgePanel participants are recruited nationally by using random-digit-dialing telephone methodology. The panel is representative of the US population and closely tracks the December 2007 Current Population Survey (CPS) on age, race, Hispanic ethnicity, geographic region, employment status, and other demographic variables.

At the beginning of the survey in December 2009, gas prices nationally were at a relative low of $2.60 per gallon. The beginning of the year had seen even lower prices, at $1.85 per gallon. However, memories of high gas prices likely were still salient; June 2008 had seen a surge to more than $4 nationally, with gas prices receiving heavy emphasis during the presidential primary contest between Barack Obama and Hillary Clinton.[20,21]

We drew 2 samples for the survey. The first sample consisted of US residents aged 18 years and older; 1361 people were sampled, and 751 completed the survey, for a completion rate of 55.2%. The second sample consisted of parents of teenagers aged 13 through 17 years (to conduct a paired interview with parents and teens for a study unrelated to the current study). Adult panelists (n=738) in the parent/teen sample were first screened to confirm that there was currently a teenager residing in their household and, if so, that they were willing to allow the teenager to complete their section of the survey; 72% (n=532) qualified. Of these, 250 completed the survey, for a completion rate of 47.0%. Across the 2 samples, 1001 people participated, and the survey completion rate was 52.9%.

To reduce the effects of any nonresponse and noncoverage bias in the overall panel membership, we applied a poststratification adjustment to the merged sample, using demographic distributions from the most recent CPS data. We obtained benchmark distributions for Internet access among the US population of adults from KnowledgePanel recruitment data because this measurement is not collected as part of the CPS. The poststratification variables were gender (men/women); age (18–29, 30–44, 45–59, and ≥60 years); race/Hispanic ethnicity (White/non-Hispanic, Black/non-Hispanic, other/non-Hispanic, ≥2 races/non-Hispanic, Hispanic); education (<high school, high school, some college, ≥bachelor's degree); census region (Northeast, Midwest, South, West); metropolitan area (yes, no); Internet access (yes, no).

We measured 3 variables specifically for this study. Because of the minimal amount of news attention paid to the expert debate over peak petroleum, we did not ask respondents directly

about peak petroleum; we instead asked about their reactions to several possible scenarios related to peak petroleum. We measured the perceived likelihood of experiencing the price consequences of peak petroleum within the next 5 years with a statement followed by a question: "Some energy experts predict that oil prices will soon begin to rise dramatically higher, possibly tripling in price within 5 years. How likely do you think this is?" Response options were very unlikely, somewhat unlikely, somewhat likely, and very likely.

After this question, we then prompted respondents to consider the potential economic consequences of peak petroleum, and then we asked them to consider the public health consequences of peak petroleum. Specifically, we asked "If oil prices were to triple over the next 5 years, how harmful or helpful to the US economy would it be?" and "If oil prices were to triple over the next 5 years, how harmful or helpful to the health of Americans would it be?" Response options to both of these 2 questions were very harmful, somewhat harmful, somewhat helpful, very helpful, don't know.

In addition, we assessed a respondent's political ideology by asking them to describe themselves in terms of one of the following options: very liberal, somewhat liberal, moderate, somewhat conservative, and very conservative. Finally, to examine the possibility that the publics' views about peak petroleum (an issue that most people have likely given little thought to) may be influenced by their views about climate change (a related issue that most people have given at least some thought to) we used a previously developed 15-item instrument to identify which of 6 climate-change audience segments each respondent belonged to.[19] The 6 audience segments are as follows: alarmed (10%), concerned (28%), cautious (27%), disengaged (6%), doubtful (13%), and dismissive (16%). These segments form a continuum from the segment most concerned about climate change (alarmed) to the segment least concerned (dismissive).[22]

We used SPSS version 18 (IBM, Somers, NY) to examine the distributions of the perceived likelihood and perceived harm measures, and we cross-tabulated all 3 against political ideology and climate change audience segment status.

RESULTS

As Table 1 indicates, most respondents (76%) said that a tripling of oil prices over the next 5 years was either very likely (24%) or somewhat likely (52%). In terms of ideology, there were statistically significant differences. Approximately 35% of respondents who considered themselves "very conservative" and 30% of respondents who considered themselves "very liberal" said a spike in oil prices was very likely; these proportions were higher than those among respondents who self-identified with middle-range ideological categories.

A similar statistically significant relationship was observed on the basis of respondents' views on climate change. As Table 2 indicates, 43% of those "alarmed" by climate change and 33% of those "dismissive" said a spike in oil prices was very likely; these proportions were substantially higher than those among the middle-range audience segments.

Perceptions of Economic Impacts

The great majority of respondents (87%) said that if oil prices were to triple over the next 5 years, it would be either very harmful (65%) or somewhat harmful (22%) to the economy (Table 1). In terms of ideology, individuals who considered themselves either "very conservative" or "somewhat conservative" were more likely to anticipate economic harm than self-identifying moderates or liberals. Those dismissive of climate change were the most likely to anticipate very harmful economic effects (75%).

Perceptions of Health Impacts

A majority of respondents (69%) also said that if oil prices were to triple over the next 5 years, it would be either very harmful (44%) or somewhat harmful (25%) to the health of Americans. In terms of ideology, those who were "very conservative" and "moderate" respondents were significantly more likely to anticipate human health harms than the "very liberal," "somewhat liberal," and "somewhat conservative" respondents (Table 1). Similarly, those "dismissive" of climate change (52%) were the most likely to anticipate very harmful health effects from a spike in oil prices.

Segmenting Audiences by Their Perceptions

To identify the most commonly believed scenarios concerning peak petroleum over the next 5 years, we categorized all respondents within a matrix on the basis of their answers to the questions assessing the likelihood of a spike in oil prices and the perceived nature of economic and health impacts (Table 3). By far the most commonly believed scenario, accounting for nearly half of our respondents (47%), was that oil prices would triple in the next 5 years and that this spike in prices would cause harm to both the economy and to the health of Americans.

Three other scenarios were anticipated by much smaller, but still important, segments of the population. In the first segment, 13% of respondents said it was likely that oil prices would triple over the next 5 years, and they anticipated that the spike in prices would harm the economy but would not harm the health of Americans. The next segment, 16% of respondents, said they did not believe that oil prices would triple over the next 5 years, but in the event that prices did spike, it would likely harm both the economy and human health. Finally, a third segment, just 9% of respondents, said that oil prices would triple, but they did not anticipate harm to either the economy or to health.

DISCUSSION

Somewhat contrary to our expectations, a large majority (76%) of the public said it was likely that oil prices would triple in the next 5 years, and more than 2 out of 3 (69%) said that such an event would be harmful to the health of Americans. Thus, a significant proportion of American adults—at least half—appear open to considering the possibility that our health is vulnerable to major shifts in energy prices. Moreover, this belief was widely shared among people of different political ideologies and was strongly held even among individuals otherwise dismissive of the issue of climate change. This latter finding is particularly intriguing because it suggests that a broad cross-section of Americans may be ready to engage in dialogue about ways to manage the risks that experts associate with peak petroleum.

TABLE 1—Perceived Likelihood of Oil Prices Tripling in Next 5 Years and Perceived Economic and Health Impacts of That Event, by Ideology: US Adults, 2009–2010

	All Respondents, %	Very Liberal, %	Somewhat Liberal, %	Moderate, %	Somewhat Conservative, %	Very Conservative, %
Q. Some energy experts predict that oil prices will soon begin to rise dramatically higher, possibly tripling in price within 5 years. How likely do you think this is?[a]						
Very likely	24	30	21	25	16	35
Somewhat likely	52	53	64	51	48	44
Somewhat unlikely	20	15	15	19	29	14
Very unlikely	5	3	1	5	7	7
Mean (SD)	2.95 (0.79)	3.11 (0.73)	3.06 (0.61)	2.96 (0.80)	2.73 (0.81)	3.06 (0.89)
No.	923[b]	40	159	404	196	126
Q. If oil prices were to triple over the next 5 years, how harmful or helpful to the US economy would it be?[c]						
Very harmful	65	58	51	66	69	80
Somewhat harmful	22	33	32	19	25	10
Somewhat helpful	6	3	11	7	3	. . .
Very helpful	2	5	2	1	. . .	4
Don't know	6	3	5	7	4	6
Mean[d] (SD)	3.60 (0.68)	3.44 (0.80)	3.38 (0.77)	3.61 (0.67)	3.68 (0.53)	3.75 (0.68)
No.	923[b]	40	157	404	196	125
Q. If oil prices were to triple over the next 5 years, how harmful or helpful to the health of Americans would it be?[e]						
Very harmful	44	38	29	49	41	53
Somewhat harmful	25	35	27	24	30	18
Somewhat helpful	11	15	18	11	11	6
Very helpful	3	8	6	3	1	. . .
Don't know	16	5	20	13	18	23
Mean[d] (SD)	3.32 (0.84)	3.10 (0.93)	3.00 (0.94)	3.37 (0.83)	3.34 (0.75)	3.60 (0.64)
No.	923[b]	40	158	403	195	126

Note. Ellipses indicate no respondent chose category.
[a]$\chi^2(12, n=925)=42.626$; $P<.001$.
[b]Numbers differ in χ^2 calculations because of rounding.
[c]$\chi^2(16, n=922)=64.445$; $P<.001$.
[d]Mean does not include "don't know" responses.
[e]$\chi^2(16, n=922)=55.031$; $P<.001$.

At the time of our survey, news coverage, polls, and public statements indicated that the American people and policymakers, especially political conservatives, were strongly concerned about the economy, jobs, and health insurance reform.[8] This context may partly explain why conservatives in our survey perceived a higher risk of the economic impacts of a spike in oil prices than other respondents. Yet our survey findings suggest that a broad cross-section of the public—including people from opposite ends of the ideological spectrum—were receptive to the idea that a significant increase in energy costs could lead to greater health risks.

Our survey questions investigating the current state of public awareness and perceptions of oil prices and health were timely and opportunistic but limited in their scope. If the public health community is to take seriously both the health risks associated with peak petroleum and the necessity of broad public participation in decision-making, then additional audience research will clearly be needed. Audience research that guides public engagement efforts should move forward even as public health experts are still in the process of identifying the actions that individuals, communities, organizations, states, and the federal government can take to prepare for and manage the health risks of peak petroleum.

In light of the low levels of news attention to peak petroleum, if we had asked respondents directly about how the issue is currently debated and labeled by experts we likely would have encountered high levels of nonresponse or "don't know" responses. Instead, we asked respondents about their perception of the likelihood of a major increase in energy prices and the harms they believed would result if this were to occur. So although Americans are unlikely to be aware of the concept of peak petroleum, the level of expert agreement on the issue, or the potentially significant impacts of peak petroleum on society, the public does possess a latent sense of a pending energy problem and is concerned about the potential consequences of this problem for public health. These are not highly salient, deeply held, or emotionally laden reactions; rather, they are more akin to latent public sentiment. However, if organizations, agencies, and institutions pursue well-coordinated and well-designed engagement initiatives, then these latent predispositions could evolve into highly

TABLE 2—Perceived Likelihood of Oil Prices Tripling in Next 5 Years and Perceived Economic and Health Impacts of that Event, by Climate Change Views: US Adults, 2009–2010

	Alarmed, %	Concerned, %	Cautious, %	Disengaged, %	Doubtful, %	Dismissive, %
Q. Some energy experts predict that oil prices will soon begin to rise dramatically higher, possibly tripling in price within 5 years. How likely do you think this is?[a]						
Very likely	43	25	17	30	9	33
Somewhat likely	40	61	57	55	54	32
Somewhat unlikely	13	14	22	16	32	22
Very unlikely	5	. . .	5	. . .	6	13
Mean (SD)	3.19 (0.86)	3.10 (0.62)	2.86 (0.75)	3.12 (0.67)	2.64 (0.73)	2.85 (1.03)
No.	96	278	222	44	127	156
Q. If oil prices were to triple over the next 5 years, how harmful or helpful to the US economy would it be?[b]						
Very harmful	56	68	64	48	65	75
Somewhat harmful	31	22	17	25	24	20
Somewhat helpful	4	4	12	7	2	3
Very helpful	3	1	1	. . .	5	. . .
Don't know	5	5	6	21	5	3
Mean[c] (SD)	3.48 (0.75)	3.65 (0.62)	3.53 (0.76)	3.51 (0.67)	3.56 (0.76)	3.74 (0.50)
No.	96	278	222	44	127	155
Q. If oil prices were to triple over the next 5 years, how harmful or helpful to the health of Americans would it be?[d]						
Very harmful	42	46	41	43	38	52
Somewhat harmful	24	24	29	16	28	25
Somewhat helpful	16	11	19	7	6	6
Very helpful	4	7	1	. . .	1	1
Don't know	14	13	11	34	28	17
Mean[c] (SD)	3.20 (0.92)	3.26 (0.94)	3.24 (0.81)	3.52 (0.74)	3.41 (0.71)	3.54 (0.66)
No.	95	279	223	44	127	155

Note. Ellipses indicate that no respondent chose category.
[a]$\chi^2(15, n=923)=110.470$; $P<.001$.
[b]$\chi^2(20, n=922)=69.115$; $P<.001$.
[c]Mean does not include "don't know" responses.
[d]$\chi^2(20, n=923)=73.495$; $P<.001$.

salient, deeply held, and informed public concerns.

In addition to the influence of engagement strategies, public concern over energy prices and future awareness of peak petroleum are likely to vary over time because of events like economic downturns, the price of gas, political focusing events, and disasters such as the 2010 oil spill in the Gulf of Mexico. At the time of our survey, the price of gasoline was a relatively low $2.60 per gallon, but gas prices currently are more than $4 per gallon nationally. Constant changes in relevant contextual factors point to the need for continuing survey research and monitoring to track and query the public on a regular basis. Moreover, our measures of the likelihood of the tripling of energy prices over the next 5 years and concern over health impacts do not measure whether the public perceives or accepts the "long emergency" of peak petroleum, including the changes to daily life and social organization predicted by some experts. As public engagement initiatives to address peak petroleum are pursued, careful measures should be developed to map this more complex understanding across segments of the public.

Although the issue of peak petroleum may be relatively new to the wider public health field, there is an important need to launch public engagement initiatives that partner members of the public with experts and officials in establishing long-term policy planning—a goal directly in line with past community-based participatory research (CBPR) initiatives in public health. CBPR methods, such as carefully organized and evaluated public forums, provide a means to effectively and efficiently gather input and foster participation from groups with varying values, concerns, and levels of expertise. Preparing for the health risks associated with peak petroleum will require the identification and consideration of matters related to ethics, values, equity, social justice, and economic trade-offs—questions too important and complex to leave to experts or government officials alone and that necessitate active input and participation from the public.

Central to the CBPR research paradigm is an equitable interaction between experts and communities, rather than the more typical top-down approach, in which experts attempt to impose their views on passive lay audiences. CBPR projects begin with research topics of importance to the community, and they explicitly recognize that stakeholders bring to the table their own priorities, points of view, and

TABLE 3—Perceived Likelihood of Societal Harms if Oil Prices Triple Over Next 5 Years, by Perceived Likelihood of Oil Prices Tripling: US Adults, 2009–2010

	No Harm, %	Economic Harm Only, %	Public Health Harm Only, %	Economic and Health Harm, %
Oil prices likely to rise	9	13	1	47
Oil prices not likely to rise	2	5	0	16

Note. Figures calculated from survey of 1001 adults. Of these, 63 (6.3%) could not be categorized because they answered "don't know" or refused to answer 1 or more of the questions.

needs that when integrated into the design of programs and interventions will enhance program effectiveness, promote co-learning by all involved parties, and empower community participants.[23,24] CPBR approaches have positive impacts on a broad range of important processes and outcomes, including research participation, knowledge dissemination, and improved community capacity, including enhanced skills, job creation, new partnerships and coalitions, enhanced research capabilities, perceptions of fairness, and increased feelings of efficacy and control.[25]

Not only will the impacts of peak petroleum need to be communicated in ways that are understandable and of personal relevance to audiences; predictions of the severity of risks will need to be consistent with the degree of uncertainty specific to each topic. If predictions on the part of experts prove wrong, or if the certainty of statements is perceived as being stronger than what is scientifically well understood, then history suggests that experts and their organizations risk losing public trust and credibility.[26,27] Communicators can, however, transparently describe and discuss the known likelihood and potential consequences of peak petroleum and can present scenarios that describe possible futures, in some cases using appropriate historical analogues. Communicators should also explain why there are remaining uncertainties about the risks of peak petroleum (e.g., differing assumptions about future technological development or consumer demand).

It is also important to emphasize that scientific uncertainty alone is not an adequate justification for inaction or business as usual. Rather, at a minimum it would be prudent to expect the unexpected, develop contingency plans, and adopt adaptive management strategies. A particular metaphor is useful to describe this orientation: actions we take to address peak petroleum now are akin to purchasing insurance that will help reduce the risks to society and protect individuals in the event that adverse impacts from peak petroleum do occur. The careful communication of uncertainty will not only be relevant to messages intended directly for public consumption but also for engaging journalists, editors, and media producers on peak petroleum.

CBPR and associated public engagement methods may also prove valuable in helping public health officials make better decisions about some inherently uncertain choices that must be made relative to peak petroleum. For example, climate change, energy scarcity, the built environment, and food security are all interconnected; should public health officials address these factors (or even communicate about them) as an integrated whole, or should they be addressed independently? How does long-term public engagement planning differ from the short-term emergency communication that would follow an acute crisis related to dramatic changes in the price of petroleum? Investment in audience research and participatory engagement will have financial, human resource, and opportunity costs, yet these costs are quite modest compared with the risks they are intended to help manage and the benefits that can accrue. We hope that this special issue of the *American Journal of Public Health*, along with other efforts on the part of the public health community, will catalyze additional research and engagement initiatives to address peak petroleum. ■

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Contributors

M.C. Nisbet led the data analysis and the writing of the article. E. Maibach and A. Leiserowitz collected the survey data used in the analysis, and they contributed to the data analysis and the writing of the article.

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