Conveying the Human Implications of Climate Change

A Climate Change Communication Primer for Public Health Professionals

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Executive Summary

There is now widespread agreement among climate scientists that the earth is warming as a result of human activity, primarily due to rising levels of carbon dioxide and other heat trapping atmospheric gases created by burning fossil fuels. It is also clear that current trends in energy use, development, and population growth will lead to continuing — and more severe — climate change over the course of this century and beyond. Climate change is expected to adversely affect the health of all Americans as well. In fact, many communities across the United States are already experiencing the negative health effects associated with climate change.

Fortunately, public health professionals have many opportunities to help the public and other decision-makers better understand the human implications of climate change, and to correct the misperception that climate change primarily harms the non-human world. Americans value good health and the well-being of their community members. We are positioned to explain how the rapidly emerging threats associated with climate change are connected with individual and community health. By communicating the potential of global climate change to harm human health in communities across America, and by conveying the potential to improve human health through actions that limit climate change, we can enhance public understanding of the full scope of the problem, and help enable appropriate responses by individuals and communities.

As such, this primer was developed to help public health professionals communicate the health implications of climate change to the public, to policy makers, and to other professionals whose work is — or will be — affected by climate change. Specifically, this primer is organized into three sections so as to answer the following questions:

1) WHY should public health professionals communicate about climate change?

2) With WHOM should public health professionals communicate about climate change?

3) HOW should public health professionals communicate so as to be most effective?

WHY?

Climate change is a serious threat to the public's health and wellbeing worldwide.

Climate change harms human health, both directly and indirectly, in a variety of important ways. Direct effects can include earth system changes, including rising temperatures, increasing climate variability, increased rainfall and snowfall in some areas and drought in others, and more frequent severe weather events, all of which have considerable potential to affect human health. Indirectly, climate change brings new challenges to the control of infectious diseases. Climate-related ecosystem changes can increase the range, seasonality, and infectivity of some vector-borne diseases. Additionally, downpours can trigger sewage overflows, contaminating ground water that is often used for crop irrigation and drinking water.

The health of Americans is already being harmed by climate change, and it's likely to get worse in the not too distant future.

Climate change is expected to adversely affect the health of all Americans as well. In fact, many communities across the United States are already experiencing the negative health effects associated with climate change.

Many public health officials are aware of these risks, but the public is not.

A majority of local public health officials in the United States are aware of the growing human health risks associated with climate change. Many of these health officers report that they are already seeing the human health impacts of climate change in their jurisdiction, and that they expect these impacts will get worse over the next 20 years. However, there is a serious disconnect between what public health officials know about the health threats associated with climate change, and what the public knows, or does not know. The public is largely unaware that climate change threatens human health, much less their own health and the health of other members of their community.

Public health professionals have an obligation to prevent climate change from harming human health, to the extent possible. This requires, at a minimum, effectively informing the public and other decision-makers about the risks.

As public health professionals, we are uniquely well positioned to explain how the rapidly emerging threats associated with climate change are connected with individual and community health and wellbeing. By communicating the potential of global climate change to harm human health, and by conveying the potential to improve human health through actions that limit climate change, we can enhance public understanding of the full scope of the problem, and help enable appropriate responses by individuals and communities.

WHOM?

News organizations, journalists, community media outlets, and prominent bloggers

It is vital that journalists — both professional and citizen journalists — understand the connection between human health and climate change, and be provided resources and opportunities to report on the topic. If news organizations are not covering climate change and public health, the issue falls from (or never rises to) the community's dialogue and decision-making agenda.

Decision-makers in government, business, and non-profit organizations

If decision-makers in government, business, and non-profit organizations do not understand the human health impacts and the health co-benefits associated with various potential policies and programs, they are unlikely to make sound decisions that take strong action on climate change mitigation and adaptation procedures. Thus, it is vital that health professionals help decision-makers make these connections.

Other professionals whose work is — or will be — affected by climate change

Professionals across a variety of disciplines are — or should be — considering how to help communities and organizations respond to climate change. These include energy, water, transportation, housing, land use, agriculture, environment and natural resource professionals, and health care providers. Each of these and other related professional audiences — each with their own culture and means of acquiring information — benefit from an understanding of the health implications of climate change. Credible and timely information about the health implications of climate change may inform relevant decisions that they are making.

The public, and various segments therein

A public informed about the health implications of climate change is a public that is more likely to support thoughtful public dialogue and to participate in decision-making. For example, educating people about the human health impacts of climate change can persuade them to take steps to prepare themselves and their families for dangerous climate-related weather events, such as heat waves or hurricanes. It can also motivate them to take steps to reduce their household's environmental footprint, by choosing to commute on foot or by biking instead of driving a car. In addition, the relevance of health impacts may motivate them to attend public meetings, discuss the issue with their friends and co-workers, and to contact public officials to voice their concerns and preferences.

HOW?

Public health organizations have myriad ways to share what they know about the health impacts — and health opportunities — associated with climate change.

Getting the message right

Frame the issue as a human health problem — rather than as an "environmental problem" — to help the public and other decision-makers consider and engage in the issue of climate change.

Framing is an important process by which communicators can enhance their impact by linking messages and recommendations to their audience members' deeply held values and beliefs. Framing the relevance of climate change in ways that connect to core values or familiar issues — i.e., making the case that climate change is a major threat to people's health and well-being — has potential to engage a much broader cross-section of the American public than has previously been engaged in the issue.

Localize the issue.

Although the majority of Americans consider climate change a serious problem, they generally think of it in geographically and temporally distant terms. This is likely because most Americans are not aware of the effects of climate change that are occurring here and now, including in their community. Re-framing climate change as a public health issue can help reveal local angles of a global problem, thereby making the problem more concrete, and moving the location of impacts closer to home.

Emphasize the immediate health benefits — i.e., the "win-wins" — associated with taking action.

Many actions taken to address climate change create "win-win" situations in that — in addition to helping address climate change — they immediately begin to create important public health benefits. Therefore, highlighting the health benefits associated with taking action against climate change — including benefits that have nothing to do with climate change per se — is a useful way of accentuating the positive, giving people important additional reasons to support helpful programs, policies, and individual actions.

When possible, make or reinforce four key points:

1. Climate change is real and human caused.

2. Climate change is bad for us and for our community in a number of ways.

3. We need to start taking action now to protect the health of our community's most vulnerable members — including our children, our seniors, people with chronic illnesses, and the poor — because our climate is already changing and people are already being harmed. [Our top priorities for protecting people's health from our changing climate are (list your organization's top three priorities here).]

4. Taking action creates a "win-win" situation for us because, in addition to dealing with climate change, most of these actions will benefit our health too.

Use the fundamentals of good communication.

When communicating, take advantage of techniques that capture people's attention and enhance the odds of influencing people's actions. Practical advice on the fundamentals of good communication can be found in many publications including Health Canada (2011), Heath and Heath (2007), Rimer and Kreuter (2006), and Maibach and Parrott (1995).

Getting the message out

Strengthen the knowledge base — and the ability to work across program areas — within your own health department.

Public health organizations' own employees, regardless of their job title, are a vital yet often overlooked channel of communication about important public health issues. Strengthening the knowledge base about the public health relevance of climate change within public health organizations is an important place to begin the public outreach process. Staff development activities on climate change will also strengthen your organization's ability to deal with climate change by encouraging collaboration across program areas.

Create a section — or simply post information — on your website about climate change and human health.

Your website is an invaluable source of information for your employees, and for many important stakeholders in your community (including the news media). It presents an important opportunity for your organization to help both internal and external audiences understand the relevance of climate change to the health and wellbeing of people in your community.

Contact news media outlets in your area.

Health news is a perennial favorite of news outlets, including newspapers, television, radio, and online. The climate change and health story — especially to the degree that it can be localized — has considerable potential to interest local news outlets. Briefing the editorial board of your local paper, local TV and radio producers, local weathercasters, and prominent local bloggers are all potentially helpful options.

Partner with other local organizations to draw attention to the health impacts related to climate change.

Framing climate change as a public health issue creates opportunities to engage important new partners in the issue who, in turn, can help explain the issue to the public and decision-makers, and who can help develop and implement response plans. Protecting human health is an issue that crosses institutional, scientific, and political boundaries. A focus on improving health is an important way to humanize the issue of climate change, and to encourage cross-cutting collaborations across communities.

Use regional meetings to create news attention.

Evidence suggests that in the few instances when government agencies have sponsored regional meetings featuring experts discussing localized climate change impacts, these meetings trigger subsequent coverage of public health consequences.

Issue coalition statements that frame news coverage.

Creating or participating in a climate action coalition, and using coalition statements as a basis for media outreach, has been shown to be an effective means of generating and beneficially framing news coverage on important issues such as climate change.

Write opinion-editorials and guest columns that reach readers directly.

Success at placing opinion-editorials creates important communication opportunities in that op-eds are often read by a broad cross-section of the community, including and perhaps especially community "influentials" (i.e., policy makers and the people who influence them). As such, op-eds and columns frequently lead to additional public discussion of the content (e.g., on talk radio, in community meetings, etc.).

Issue a scientific report or study on local/regional health impacts and cultivate press coverage.

Scientific reports, when specifically promoted to the news media, can be a very effective mechanism for generating news coverage, beneficially framing the issue, and stimulating community dialogue about the findings of the report, and the issue in general.

Develop contexts and opportunities for communities to discuss, learn, connect, and plan.

Sponsoring face-to-face and/or web-based opportunities for experts, stakeholders, and the public to come together and discuss, plan, and learn about the risks and responses to climate change is an important means through which to enhance community engagement and response capacity.

Use social media to encourage public participation in the dialogue.

Fostering digital news communities — that can include original reporting and professionally edited news content, features, and commentaries along with a range of user-generated and social media functions — is another important means by which to enhance community engagement and response capacity.

Identify, recruit, and train opinion leaders.

Perhaps the most effective way to connect with and engage the community is to identify, recruit, train, and support informal opinion leaders. Once activated, informal opinion leaders have unrivaled capacity to engage members of the larger community around them.

Request permission to testify at routine city/county council meetings and dedicated public hearings on relevant projects (e.g., transportation projects, housing projects, etc.).

The need to include a public health perspective on climate change is often overlooked at relevant community and government hearings, precisely because the public health community has not typically been a leading voice in public deliberations about climate change thus far. Hearings of this type create a golden opportunity to share a public health perspective on climate change with a full range of stakeholders.

Introduction

Every public health professional knows that effective communication is one of the most powerful tools through which to protect and promote the public's health. Public health professionals use communication in a wide variety of ways to inform people, communities, organizations, and public officials about risks to health, and about options for reducing those risks and fostering improved health. Effective communication has played important roles in ameliorating and managing a wide range of public health problems — including tobacco and substance use, cardiovascular disease, HIV/AIDS, vaccine preventable diseases, SIDS, automobile injuries and fatalities — thereby contributing greatly to the health and wellbeing of Americans, and to people around the world [1,2].

It is now time for members of the public health community to use their collective voices to alert, inform, and guide the American people relative to climate change, which may well become the leading public health threat of the 21st century. Dr. Georges Benjamin, Executive Director of the American Public Health Association, made this point quite clearly in his recent statement:

Georges Benjamin, MD, Executive Director, American Public Health Association

" Climate change is one of the most serious health threats facing our nation. Yet few Americans are aware of the very real consequences of climate change on the health of our communities, our families and our children. [3] "

Dr. Margaret Chan, Director-General of the World Health Organization, made this point even more bluntly in stating:

" We need to… convince the world that humanity really is the most important species endangered by climate change. [4] "

In this primer, we take the position that there are three compelling reasons for American public health officials to engage in communicating the human side of climate change:

1. The health of Americans is already being harmed by climate change. The magnitude of this harm is likely to get much worse if effective actions are not soon taken to limit climate change, and to help communities successfully adapt to unavoidable changes in their climate. Therefore, we have a responsibility to inform communities about these risks and how these harms can be averted.

2. Climate change public engagement efforts to date have focused primarily on the environmental consequences of the threat. These efforts have mobilized an important but still relatively narrow range of Americans, but have also in some cases contributed to strong political disagreement. As public health professionals, we have many opportunities to convey the hu-

man consequences and implications of climate change, and to connect the issue to Americans' broadly held health values. In doing so, we have opportunities to engage a broader range of Americans in the issue, thereby enhancing climate change understanding and decision-making capacity among members of the public, the business community, and government officials.

3.   Many of the actions that help limit climate change and help us adapt to it — actions that can be taken by individuals, communities, states, regions, and nations — also improve human health in important ways completely unrelated to climate change. These "co-benefits" of taking action against climate change include increased physical activity, decreased obesity, reduced motor vehicle related injuries and death, reduced air and water pollution and reduced morbidity and mortality associated with it, increased social capital in and connections across communities, and reduced levels of depression. Therefore, actions taken to address climate change are a "win-win" in that they help us make progress toward other high priority public health goals.

Below, we elaborate on these reasons and provide practical advice to help public health organizations effectively communicate the human side of climate change. We were fortunate to find a number of public health organizations already engaged in this work, and they generously shared examples of their work; those examples are provided throughout this primer. We hope to find additional examples and include them in subsequent editions of this primer; please share your examples with us, now or in the future, so that we may share them more broadly with the public health community at large.

This document does not attempt to provide a comprehensive review of the human health implications of climate change. Rather, its purpose is more limited. It seeks to help the public health community — in cities and counties across America — finds its voice on climate change. The voice of public health has been largely absent from the public dialogue on climate change, a dialogue that is often erroneously framed as an "economy vs. the environment" debate. We believe that introducing the public health voice into the public dialogue can help communities see the issue in a new light, thereby promoting more thoughtful engagement in, and decision-making about, the issue.

A more comprehensive view of the human health implications of climate change in the United States can be found in a number of important recent reviews and guidebooks produced by *Trust for America's Health (2009)*, the *US Global Change Research Program (2009)*, the *National Institute of Environmental Health Sciences (2010)*, and the *American Public Health Association* with the *Centers for Disease Control and Prevention (2011)*. We encourage readers to download and review these excellent free publications.

A Note Regarding Terminology: Climate Change vs. Global Warming

This guide uses the terms climate change and global warming, more or less interchangeably, to refer both to the increase in mean global temperature that has occurred since the start of the industrial age, and to the additional climatic changes (e.g., changing patterns of precipitation) that have accompanied the increase in mean temperature. The term climate change more accurately describes the phenomenon, and it is the term preferred and used by most scientists and other technical professionals. Therefore, it is the preferred term to use when communicating with most technical audiences.

Global warming, however, is the term most frequently used by members of the general public. Audience research has shown that the term climate change has less emotional resonance with most members of the public, likely because it is abstract and therefore hard to fathom. For this very reason, during much of the last decade communicators who specifically wished to avoid engaging members of the public in the issue, intentionally and strategically used the term climate change rather than global warming.

Recent research has shown that most members of the public are comfortable with either term[5], although members of the "Alarmed" segment strongly prefer the term global warming while members of the "Dismissive" segment strongly prefer the term climate change (see Ch. 2 for the explanation of Global Warming's Six Americas). Other recent research has shown that Democrats respond to the two terms in equivalent ways, but not Republicans. Republicans are more likely to endorse the phenomenon as real if it is termed "climate change" (60%) rather than "global warming" (44%), as compared to approximately 86% of Democrats who endorse the phenomenon as real regardless of the term used[6].

Given the importance of names in effective communication, it would appear that further research is needed to settle the issue of which name is best for use in communicating to the general public. At present, it is not clear to us which, if either, is the superior term.

1 | Why Should Public Health Professionals Communicate About Climate Change?

1.1 Climate change is a serious threat to the public's health and wellbeing worldwide.

There is now widespread agreement among climate scientists that the earth is warming as a result of human activity [7,8], primarily due to rising levels of carbon dioxide and other heat trapping atmospheric gases created by burning fossil fuels. It is also clear that current trends in energy use, development, and population growth will lead to continuing — and more severe — climate change over the course of this century and beyond [9].

Climate change harms human health, both directly and indirectly, in a variety of important ways. Direct effects can include earth system changes, including rising temperatures, increasing climate variability, increased rainfall and snowfall in some areas and drought in others, and more frequent severe weather events, all of which have considerable potential to affect human health. Heat waves, for example, can cause direct effects such as dehydration, heat exhaustion, and heat stroke.

Indirectly, climate change brings new challenges to the control of infectious diseases. Climate-related ecosystem changes can increase the range, seasonality, and infectivity of some vector-borne diseases [10]. Many of the major killers are highly climate sensitive as regards temperature and rainfall, including cholera and the diarrhoeal diseases, as well as malaria, dengue, and other infections carried by vectors. Downpours can trigger sewage overflows, contaminating ground water that is often used for crop irrigation and drinking water. In the U.S., for example, these consequences will be particularly severe in the roughly 770 cities and towns, including New York, Chicago, Washington DC, Milwaukee, and Philadelphia, that have "combined sewer systems;" an older design that carries storm water and sewage in the same pipes [11]. These and other health effects of climate change — and the populations most affected — are summarized in Table 1.

Perhaps most seriously, the changing global climate is also affecting the basic requirements for maintaining health — including clean air and water, sufficient food, and adequate shelter — and placing other pressures on the natural, economic, and social systems that sustain health, which can contribute to poverty, population dislocation, and civil conflict [9]. For example: mass environmental displacement and migration has the potential to disrupt the lives of hundreds of millions of people, intensifying the growing issues associated with urbanization and reverse successes in development; economic downturns and collapse erode both population health and societal development; and armed conflicts that can result from resource scarcity and competition, and from

migration and clashes between host and migrant groups can lead to large scale loss of life and morbidity [12]. The burden of all of these conditions is expected to increase as climate change advances.

Table I: Health Effects of Climate Change in the United States		
Weather Event	**Health Effects**	**Populations Most Affected**
Heat Waves	Premature death Heat-related illnesses such as heat stroke, heat exhaustion, and kidney stones	The elderly Children Diabetes Poor, urban residents People with respiratory diseases Those active outdoors (workers, athletes, etc.)
Poor air quality	Increased asthma Increased chronic obstructive pulmonary disease (COPD) and other respiratory diseases	Children Those active outdoors (workers, athletes, etc.) The elderly People with respiratory diseases The poor
Hurricanes	Death from drowning Injuries Mental health impacts such as depression and post-traumatic stress disorder Increased carbon monoxide poisoning Increased gastrointestinal illness Population displacement/homelessness	Coastal residents The poor The elderly Children
Extreme rainfall and floods	Death from drowning Injuries Increased water-borne diseases from pathogens and water contamination from sewage overflows Increased food-borne disease	Residents in low-lying areas The elderly Children The poor Residents in the Southwestern U.S.
Wildfires	Death from burns and smoke inhalation Injuries Eye and respiratory illness due to fire-related air pollution	People with respiratory diseases
Droughts	Disruptions in food supply Changing patterns of crops, pests, and weed species Water shortages Malnutrition Food- and water-borne disease Emergence of new vector-borne and zoonotic disease	The poor The elderly Children
Increased average temperature	Increased food-borne disease, such as Salmonella poisoning Increased vector-borne disease such as West Nile virus, equine encephalitis, Lyme disease, Rocky Mountain spotted fever, and hancavirus Increased strain on regional drinking water supplies Increased vulnerability to wildfires and associated air pollution	Children Those active outdoors (workers, athletes, etc.)
Increased temperature and rising carbon dioxide levels	Increased allergies caused by pollen Increased cases of rashes and allergic reactions from toxic plants such as poison ivy, stinging nettle, and other weeds	People with respiratory disease People with acute allergies Children Those active outdoors (workers, athletes, etc.)

[Reprinted from Trust for America's Health (2009).]

In total, the direct and indirect health effects of climate change threaten to slow, halt, or in some cases reverse — possibly dramatically so — the progress made in enhancing the public's health worldwide over the past several decades.

Climate change is expected to adversely affect the health of all Americans as well [13-15]. In fact, many communities across the United States are already experiencing the negative health effects associated with climate change [16].

1.2 The health of Americans is already being harmed by climate change, and it's likely to get worse in the not too distant future.

1.2.1 Illness and death from extreme heat

Heat is already the leading cause of weather-related deaths in the United States, yet virtually all heat-related illness and death is preventable if the appropriate prevention strategies are implemented by communities and individuals. More than 3,400 deaths between 1999 and 2003 were reported as resulting from exposure to excessive heat [17]. Temperatures in the U.S. continue to rise and the probability of severe heat waves is increasing. Analyses suggest that heat waves are expected to continue to increase in frequency, severity, and duration [15,18,19]. Local average temperature increases will be far more variable, with some places more prone to extremes than the global community. For example, a study of climate change impacts in California projects that, by the 2090s, annual heat-related deaths in Los Angeles will increase by five to seven times, compared to a 1990s baseline of about 165 deaths [15].

Additionally, city residents and city infrastructure have unique vulnerabilities to extreme heat resulting from climate change. As cities grow, they alter local climates through the urban heat island effect. This effect occurs because cities absorb, produce, and retain more heat than the surrounding countryside. The urban heat island effect has raised average urban air temperatures by 2 to 5°F more than surrounding areas over the past 100 years, and by up to 20°F more at night [20]. Such temperature increases, on top of the general increase caused by human-induced global warming, affect urban dwellers in many ways, influencing health, comfort, energy costs, air quality, water quality and availability, and even violent crime, which increases at high temperatures [21-24].

1.2.2 Injury, illness, and death from extreme precipitation

Heavy downpours (which can cause flooding) have increased in recent decades and are projected to increase further as the world continues to warm [18,19]. Over the last century, there was a 50% increase in the frequency of days with precipitation over four inches in the upper Midwest [19]. Other regions, notably the South, have also seen strong increases in heavy downpours, with most of these coming in the warm season and almost all of the increase coming in the last few decades. As such, some diseases transmitted by heavy downpours and flooding are likely to increase. For example, heavy rain and flooding can contaminate certain food crops with feces from nearby livestock or wild animals, increasing the likelihood of food-borne disease associated with fresh produce[14]. And, cases of water-borne *Cryptosporidium* and *Giardia* may increase following heavy downpours. These parasites can be transmitted in drinking water and through recreational water use, causing diarrhoeal diseases [14].

1.2.3 Vector-, food-, and water-borne disease

Certain vector-, food-, and water-borne diseases are expected to occur more often and affect new populations as a result of changes in temperature and precipitation, which allow these pathogens to expand into new geographic regions. For example, populations living in mountain states may become more susceptible to certain vector-borne diseases as a result of warming temperatures, which allow these vectors, such as mosquitoes, to live and reproduce at higher elevations.

Some of the effects caused by these pathogens are already being felt in the wake of extreme weather

Opportunities for Communicating Climate Change Health Messages

Focusing events — such as extreme heat, drought, outbreaks of vector-borne or food- and water-borne disease, allergy season, and poor air quality — create opportunities to both educate various audiences that such events are projected to increase in frequency and intensity as a result of the changing global climate, and to encourage communities to consider how they can prevent people from being harmed by these events.

events such as droughts, flooding, and hurricanes, and as such present a fairly immediate concern. For example, it is estimated that there are 38 million cases of food- and water-borne illness in the United States each year, resulting in over 180,000 hospitalizations and 2,700 deaths [25].

1.2.4 Respiratory problems and disease

In recent decades, the nation has seen a sharp rise in prevalence as well as severity of respiratory diseases [26]. Many respiratory allergic diseases are seasonal with climate sensitive components. As such, climate change may increase the incidence and exacerbation of such allergic diseases. Management of asthma and other respiratory allergic diseases relies on several factors including strict control of exacerbation triggers of the diseases. Although not all asthmatic episodes are triggered by environmental factors, a significant number are, including factors such as ambient air pollutants, allergens, stress, and a host of other environmental variables. As a result, changes to the environment may adversely impact the severity of climate-sensitive diseases.

Spotlight On

The Connection Between Climate Change and Air Quality in California

Californians currently experience the worst air quality in the nation. More than 90% of the population lives in areas that violate state air quality standards for ground-level ozone or small particles. These pollutants cause an estimated 8,800 deaths and over a billion dollars in health care costs every year in California. Higher temperatures are projected to increase the frequency, intensity, and duration of conditions conducive to air pollution formation, potentially increasing the number of days conducive to air pollution by 75 to 85% in Los Angeles and the San Joaquin Valley, toward the end of this century, under a higher emissions scenario, and by 25 to 35% under a lower emissions scenario. Air quality could be further compromised by wildfires, which are already increasing as a result of warming.

[Reprinted from USGCRP (2009).]

1.3 Many public health officials are aware of these risks, but the public is not.

A representative national survey of local public health officers conducted in 2008 found that the majority of local public health officials in the United States are aware of the growing human health risks associated with climate change [27,28]. Many of these health officers reported that they are already seeing the human health impacts of climate change in their jurisdiction, and that they expect these impacts will get worse over the next 20 years. The most commonly reported climate change health impacts were heat related illnesses (56%), storm and flood related health impacts (47%), drought and fire related health impacts (47%), and vector-borne infectious diseases (42%). Over half of the health officials (56 to 73%) indicated that they anticipate these health problems will become more common over the next 20 years in their jurisdiction as a result of climate change. Overall, 60% reported that their jurisdiction would experience serious public health problems as a result of climate change over the next two decades. Relatively few of the health officials who reported local health impacts of climate change said that they have the necessary resources to deal with the problem.

Studies conducted in California and Oregon showed similar results — there is wide agreement among public health officers in both states that climate change poses a serious risk to public health [29,30]. In Oregon, almost 60% agreed that the county they work in was already experiencing the impacts of climate change. Agreement increased to 88% when asked if their county will experience the impacts of climate change in the next twenty years. And half said they expected to experience one or more serious public health problems as a result of climate change. Similarly, California found wide agreement among local health officers that climate change poses a serious risk to public health: 94% believe that climate change is either a "very" or "somewhat" serious threat.

There is a serious disconnect between what public health officials know about the health threats associated with climate change, and what the public knows, or does not know. The public is largely unaware that climate change threatens human health, much less their own health and the health of other members of their community. Relatively few Americans, without prompting, report that climate change has any connection to human health, although with prompting they are easily able to imagine such a relationship [31]. Most members of the public, therefore, almost certainly fail to consider the health implications of climate change when they make decisions as consumers (e.g., how to commute), and as citizens (e.g., what to ask of their elected leaders).

Moreover, the majority of the public is unaware even of the scientific consensus about human-caused climate change. While two recent studies have shown that approximately 95% of active climate scientists are convinced that the planet is warming as a result of human activity [7,8], in early 2010 only about one third of American adults [32], and 41% of television news directors [33] believed that "most scientists think global warming is happening."

1.4 Public health professionals have an obligation to prevent climate change from harming human health, to the extent possible. This requires, at a minimum, effectively informing the public and other decision-makers about the risks.

Public health professionals have an obligation to prevent both routine and catastrophic harm, when possible. Routine or expected harms are those that are incremental and projectable, such as increased hospitalizations during heat waves and bad air quality days. Because of climate change, these types of risks are expected to harm human health more frequently in the future. "Black swans" — unexpected events with severe consequences — are likely to become more frequent as the earth's climate becomes less stable; emerging infectious disease outbreak and extreme flooding are examples of such harms.

As such, health professionals need to help their community anticipate and plan for both the expected and the unexpected, especially if the latter presents the catastrophic potential to harm human health. As communities plan and invest in their future, they should be aware of how climate change is expected to contribute to an increase likelihood and severity in several major health risks.

This is especially the case for historically under-served and economically-disadvantaged communities and population segments, which tend to include disproportionate numbers of minorities, children, and elderly, many of whom lack adequate access to health care and suffer from both food and energy insecurity. Public health professionals not only have an ethical obligation to help these communities manage their immediate needs on risks ranging from air quality to extreme heat, but also to empower these communities to participate in collective decisions about how best to manage the health risks of climate change going forward.

Fortunately, public health professionals have many opportunities to help the public and other decision-makers better understand the human implications of climate change, including correcting the misperception that climate change primarily harms the non-human world. Americans value good health and the opportunity to live healthfully. As public health professionals, we are uniquely well positioned to explain how the rapidly emerging threats associated with climate change are connected with individual and community health and wellbeing. By communicating the potential of global climate change to harm human health, and by conveying the potential to improve human health through actions that limit climate change, we can enhance public understanding of the full scope of the problem, and help enable appropriate responses by individuals and communities.

2 | With Whom Should Public Health Professionals Communicate About Climate Change?

2.1 News organizations, journalists, community media outlets, and prominent bloggers

It is vital that journalists — both professional and citizen journalists — understand the connection between human health and climate change, and be provided resources and opportunities to report on the topic. If news organizations are not covering climate change and public health, the issue falls from (or never rises to) the focus of discussion and decision-making.

In a variety of ways, news coverage identifies the most salient issues and enables experts, policy makers, and the public to recognize and learn about the relevance of a health problem such as climate change, how to become involved, and how to partner with others around solutions. Newspapers in particular can and should play a central coordinating and capacity-building function in society's response to the health threats of climate change, drawing attention to community needs in terms of both mitigation and adaptation. Even as the media system rapidly evolves, studies find that local newspapers remain at the core of a community's news ecology, serving as the major source for original reporting on problems and policy debates, with this reporting driving the agenda of the rest of a community's media outlets from local television to blogs [34].

Margaret Chan, MD, Director-General, World Health Organization

Unfortunately, however, journalists rarely report on the health effects of climate change, and when they do it is often not accurate [35]. For example, health impacts such as extreme heat, disease, and respiratory problems, and more vivid threats such as hurricanes, are mentioned in fewer than 5% and 10% of the climate change-related articles in national and regional papers, respectively. Most stories that mention health threats are reported in reaction to an event such as a heat wave, resulting in momentary, episodic attention to the health risk, followed by long periods of inattention.

Moreover, recent analyses find that a growing audience of nearly 60 million Americans regularly receives information from ethnically oriented TV, radio, newspapers, and websites, many of which are published or broadcast in languages other than English. African-American and Spanish-language media have shown the sharpest rise in audience [36]. Yet despite their increasing popularity and use, few of these ethnic media outlets have the resources or expertise to cover climate change and its health consequences. Strategies are needed therefore on the part of public health experts and organizations to make it possible for coverage of climate change to appear at these outlets.

In addition to ethnic media, in many cities, interactive social media and news sites have emerged that combine "pro-am" contributions from journalists and lay citizens. Some of these initiatives are independent, while others in-

volve the expansion of content online by public radio and TV organizations. These sites, such as Voice of San Diego, Climate Health Connect.org, and KQED.com, are often "hyper-local" combining originally reported news with listings of community-based activities and the aggregation of news content from other media sources. These emerging models of community media are important outlets for engaging audiences on climate change and public health. The interactivity at these sites also allows for an ongoing conversation with the types of citizens who will be turning out to community meetings and other "real world" events to plan, connect, and take action with others. However, like traditional news organizations, these initiatives are limited in their capacity to adequately cover climate change and its public health implications.

The lack of news coverage in all of the aforementioned forms of news is important, since historically, media attention plays a critical role in helping experts, policy makers, and the public to recognize and learn about the relevance of systemic problems like climate change, how to become involved, and how to partner with others around solutions [37]. In addition, policy makers, business leaders, and professional groups have a strong intuitive if not formal sense of how the news media can "prime" public evaluations of their performance. As a result, when news attention to an issue increases, in order to protect their public image, key decision-makers from across the public and private sectors are more likely to take action to address the problem. In this way, news coverage both reflects and often drives policy action on highly technical policy issues such as climate change [38,39].

2.2 Decision-makers in government, business, and non-profit organizations

As previously stated, very few local public health officials in the United States report that they have been able to make climate change a priority [28], and few members of the general public are aware of the public health implications [31,40]. Evidence suggests that policy makers are similarly disengaged. A recent study finds that even in California, which has been a leader in legislative action on climate change generally, state legislators and staff do not consider public health as a major climate change-related risk, are not well informed about adaptation strategies, and do not know what as policy makers they could do about health-related risks of climate change [41].

History suggests these are classic indicators of a society ill-prepared to respond to an emerging health problem. Even with greater attention and recognition, implementing adaptation measures to protect the health of the public will be no small task. Adaptation efforts demand ongoing public consultation, information sharing, deliberation, compromise and trade-offs, community-wide coordination, and considerations of equity and justice that prioritize the needs of the highest risk communities [10].

Public health officials can assist policy makers responsible for actions to reduce greenhouse gas emissions by heightening their awareness of the health co-benefits of climate policies and their monetary value. Recently, a series of papers in the *Lancet* quantified health outcomes from increased household energy efficiency, walking and cycling, less consumption of animal products, and cleaner fuels and technologies in order to better integrate health gains and cost savings into climate policy decisions [42-47]. A public health approach to climate change may also have more relevance at local governmental levels. More walkable communities, public transit systems and urban reforestation serve to protect global climate, but of perhaps

Spotlight On
Outreach to Government Decision-Makers in California

Since 2006, the Alameda County Department of Public Health has been developing relationships with staff in city and county planning, transportation, and redevelopment departments throughout their county. They have provided training to these key staff on the importance of public health and equity considerations in local planning and the availability of public health data for their use.

They have also been active in trying to get health and equity incorporated into local climate action plans, and in engaging members of vulnerable populations in the dialogue.

http://www.acphd.org/healthequity/

The Santa Barbara County Public Health Department has been engaged in providing a public health perspective into the General Plans of local cities, encouraging the use of locally grown produce, supporting farmers markets, community gardens, and conservation and recycling programs.

http://www.countyofsb.org/phd/ environmentalhealth.aspx?id=1444

more relevance to local officials, they also directly reduce air pollution levels in their municipalities, and may aid them in achieving other environmental objectives, such as reduced ground level ozone.

If decision-makers in government, business, and non-profit organizations do not understand the human health impacts and the health co-benefits associated with various potential policies and programs, they are unlikely to make sound decisions that take strong action on climate change mitigation and adaptation procedures. Thus, it is vital that health professionals help decision-makers make these connections.

Finally, public health officials need to engage the local business and NGO community to inform them of the risk climate change poses to their employees' health and what steps can be taken to prevent and prepare for climate change. For example, increases in very hot days and heat waves are expected to affect construction activities for highway workers. Public health officials could partner with these business owners in order to keep abreast of climate-related illnesses that affect their workers.

2.3 Other professionals whose work is — or will be — affected by climate change

Professionals across a variety of disciplines are — or should be — considering how to help communities and organizations respond to climate change. These include energy, water, transportation, housing, land use, agriculture, environment and natural resource professionals, and health care providers. Each of these and other related professional audiences — each with their own culture and means of acquiring information — benefit from an understanding of the health implications of climate change. Credible and timely information about the health implications of climate change may inform relevant decisions that they are making.

Public health officials must especially reach out to health care professionals in order to educate them about the risks their patients face. Patients view health care providers as trusted sources of information. By educating clinicians about the health risks associated with climate change, the clinicians will be better positioned to counsel their patients about opportunities to prepare for and respond to climate change-related events. Health care professionals who have greater awareness of the impact of climate change on their patient's health may also serve as better early warning systems of new public health problems posed by climate change.

Protecting human health is an issue that crosses institutional, scientific, and political boundaries. In the United States, no single institution at the local, regional, or federal level can fully protect public health without cooperation from other institutions. In addition, no single scientific field is capable of accomplishing all aspects of the research needed to understand the human health consequences of global climate change; such an endeavor will require a broad-based, trans-disciplinary research portfolio. Identifying research needs; mobilizing and creating the expertise, resources, tools,

Spotlight On
Outreach to Health Care Professionals

The Climate Literacy Consortium is a collaboration of the leading organizations around the country working to educate health care professionals about the relationship between climate change and human health, thus leading to a deeper understanding of how climate change policy and consumption choices influence the health of our communities. The Consortium has developed both a Clinician and Administrator version of a PowerPoint on Climate Change and the Role of Health Care Professionals. Both of these presentations, as well as other key tools and resources on climate change can be found on the Health Care Without Harm webpage.

http://www.noharm.org/us_canada/issues/ climate/chlc/resources.php

Opportunities for Communicating Climate Change Health Messages

Organizations whose primary focus is on other goals but whose mission encompasses promoting health and wellbeing — such as AARP chapters, unions representing outdoor workers, NAACP chapters, and PTAs — are likely to appreciate public health perspectives on climate change, and are an excellent conduit to pass such information to their members and other stakeholders.

and technologies to address them; and translating these efforts into actions that will enable human adaptation to our changing environment while protecting public health will require collaborations on an unprecedented scale. Such collaborations should build on the strengths and capacities of individual organizations in ways that maximize the efforts of the group toward these shared goals.

2.4 The public, and various segments therein

A public informed about the health implications (and opportunities) of climate change is a public that is more likely to engage in — and support — thoughtful public dialogue and sound decision-making. For example, educating people about the human health impacts of climate change can persuade them to take steps to prepare themselves and their families for dangerous climate-related weather events, such as heat waves or hurricanes. It can also motivate them to take steps to reduce their household's energy use (e.g., choosing to commute on foot or by biking instead of driving a car), and to participate in community discussions about climate change mitigation and adaptation.

2.4.1 Vulnerable communities and at-risk populations

Decisions about taking actions to limit climate change and adapting to its health risks are too important to leave only to experts and decision-makers. The public, especially those from the most vulnerable segments of the population, should be informed and empowered to participate in collective decisions about their future. By engaging people in vulnerable communities and at-risk populations in planning and preparing for a robust response to climate change, public health officials not only ensure that those most likely to be harmed have a voice in planning programs and policies meant to avert that harm, but such outreach and inclusion can strengthen and build community resiliency in other important ways.

Spotlight On

Vulnerable Communities

The Climate Gap is a report that identifies the need to address vulnerable communities and equity as a core part of climate action and adaptation planning. Many climate change effects will fall disproportionately on low-income communities, some of which already suffer from pollution burdens. This report describes how climate change is likely to exacerbate existing environmental justice burdens.

http://college.usc.edu/pere/documents/The_Climate_Gap_Full_Report_FINAL.pdf

2.4.2 Global Warming's Six Americas

Climate change is a complex topic; communicating about it can be a challenging task. Developing a clear understanding of the audience — including what they currently believe about climate change, and how those perceptions are influenced by their values — is an important means by which to improve the outcome of communication. Research has identified six distinct groups of Americans — or audience segments — with regard to climate change [48,49]. These six audience segments — referred to as "Global Warming's Six Americas" — form a continuum, and each has a distinct response to the issue of climate change. On one end of the continuum is a group of people who are worried, involved and supportive of policy responses to global warming (13%), and on the other end is a similarly-sized group of people (12%) who are completely unconcerned and strongly opposed to policy responses. Three of the segments (totaling 65%) are to varying degrees concerned about global warming and supportive of policy responses, two (totaling 24%) are unsupportive, and one is largely disengaged (10%), having paid little attention to the issue. This disengaged audience includes a disproportionate number of people from low-income households many of whom are likely to be members of vulnerable communities.

Opportunities for Communicating Climate Change Health Messages

When engaging with people in the Doubtful and Dismissive end of the "Six Americas" continuum, discussing the harmful effects of climate change is likely to elicit counter-arguments. Instead, focusing on the health benefits associated with specific actions and solutions is likely to lead to a more productive conversation.

Global Warming's Six Americas

| Alarmed | Concerned | Cautious | Disengaged | Doubtful | Dismissive |

June 2010
n=1,024

13% 28% 24% 10% 12% 12%

Highest Belief in Global Warming
Most Concerned
Most Motivated

Lowest Belief in Global Warming
Least Concerned
Least Motivated

Proportion represented by area
Source: Yale & George Mason, June 2010
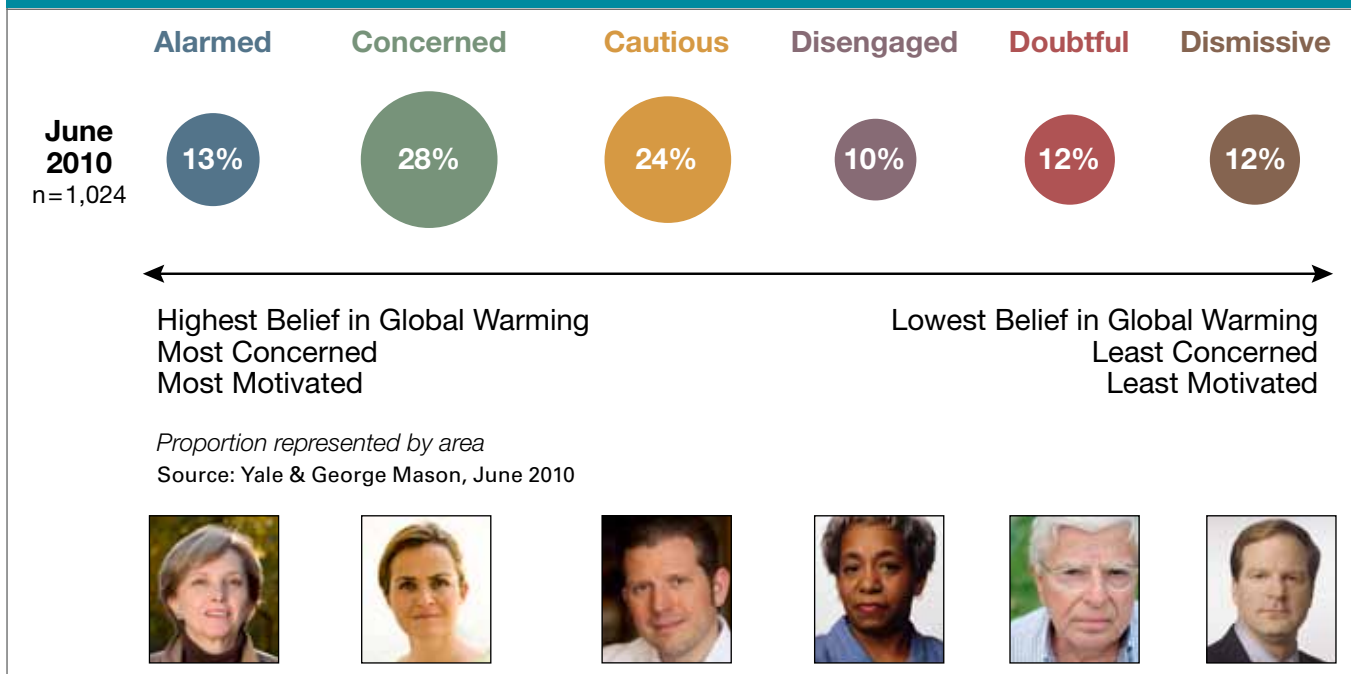
Members of the two audience segments in the middle of the continuum — the Cautious and the Disengaged — are particularly interested in learning about the health implications of climate change. When asked what one question they would pose to an expert on global warming, if given the chance, members of these segments were most likely to ask: "What harm will global warming cause?" Conversely, members of the Alarmed and Concerned segment were most likely to ask "What can the U.S. do to reduce global warming?" and members of the Doubtful and Dismissive segments were most interested in asking "How do you know that global warming is occurring?" The public health perspective on climate change is likely to be useful to all of these audiences, but especially those audiences in the middle of the continuum who are most interested in learning more about the potential impacts of climate change.

Global Warming's Six Americas:
Communicating the Health Implications of Climate Change

"If you could ask an expert on global warming one question, which question would you ask?"

What can the US do to reduce global warming?

What harm will global warming cause?

How do you know that global warming is occuring?

Source: Yale & George Mason, June 2010

3 | How Should Public Health Professionals Communicate so as to be Most Effective?

3.1 Getting the message right

3.1.1 Frame the issue as a human health problem — rather than as an "environmental problem" — to help the public and other decision-makers consider and engage in the issue of climate change.

Research over the past several decades has shown that how experts, policy makers, and journalists "frame" an issue — i.e., how they mentally organize and discuss the issue's central ideas — greatly influences how the public understands the nature of the problem, the personal relevance or societal importance of the problem, who or what they see as being responsible for the problem, and what they feel should be done to address the problem [50-53]. However, the way climate change has traditionally been framed in America — as an environmental problem — tends not to engage members of the public, at least not adequately. When climate change is framed as an environmental problem, this interpretation likely distances many people from the issue and contributes to a lack of serious and sustained public engagement necessary to develop solutions [54].

Framing is an important process by which communicators can enhance their impact by linking messages and recommendations to their audience members' deeply held values and beliefs. By framing the relevance of climate change in ways that connect to core values or familiar issues — and by repeatedly reinforcing that information through a variety of trusted sources — purposive communication can foster enhanced public engagement with the issue.

A public health frame for climate change — i.e., making the case that climate change is a major threat to people's health and well-being — has potential to engage a much broader cross-section of the American public than has previously been engaged in the issue. Suggesting a frame that resonates with peoples' broadly shared values — such as health — helps people ground their understanding of an issue in the context of their previously existing, carefully considered, and deeply held belief systems and motivations [55,56]. The health frame can also help connect the complex and poorly understood topic of climate change to risks that the public already understands and accepts as important, such as asthma and other respiratory problems, vulnerability to extreme heat, food-borne illness, and infectious disease [9,51,57]. A public health frame therefore may help shift the climate debate in the United States from one based on environmental values to one based on public health values, which are more widely held, cutting across ideology and partisanship [51,54,58].

Research has demonstrated that Americans who view climate change as being harmful to people are significantly more likely to support climate policy responses [59,60]. Other research has found that when global warming is introduced as a health problem and information is provided about how specific mitigation-related policy actions will lead to health benefits such as cleaner air to breath, healthier food to eat, and more pedestrian- and bicycle-friendly communities, a broad cross-section of Americans respond positively to this re-framing of the issue [54].

The following essay — which is framed on health — was tested with approximately one dozen people in each of the previously mentioned "Six Americas" [54]. People in all six segments responded to this essay in a manner that suggested they not only learned important new information about climate change, but that it also helped them understand the issue more fully.

Global Warming is a Threat to Peoples' Health & Wellbeing

Most people agree with the sentiment that "good health is a great blessing." Although not yet widely known, global warming poses a very real threat to the health and wellbeing of Americans and other people around the world. Experts at the World Health Organization say that global warming is already leading to an increase in the rate of some diseases and is causing many deaths. If our government and other governments around the world do not soon take steps to limit global warming, a growing number of people in the United States will likely be harmed and killed. Conversely, if our government does take steps to limit global warming, our health and wellbeing will likely improve in a number of important ways.

Our health will suffer if we don't take action. Global warming can harm people both directly and indirectly. Directly, global warming causes more extreme weather patterns including more frequent heat waves, more violent storms, and rising sea-levels — all of which can lead to people being harmed or killed. Indirectly, global warming harms the quality of our water, air and food, and our ecosystems, all of which can lead to increasing rates of disease and death. If we do not act now to limit global warming, experts at the U.S. Centers for Disease Control and Prevention say that global warming will harm people in every region of the United States. As a result of the poor air quality caused by global warming, children will become more likely to develop asthma, and the asthma they suffer from will be more severe; adults who have heart and lung diseases will become more likely to be hospitalized or die from their illness. An increasing number of extreme heat waves, floods, storms, fires and droughts caused by the changes in our climate will lead to more people being injured or killed. New infectious diseases (such as West Nile Virus) and old infectious diseases that we had previously eradicated from the United States (such as malaria and Dengue Fever) are likely to become an increasing problem for us as our climate warms.

Our health will benefit if we do take action. According to a recent study published in the medical journal *Lancet*, taking actions to limit global warming — by making our energy sources cleaner and our cars and appliances more efficient, by making our cities and towns friendlier to trains, buses, and bikers and walkers, and by improving the quality and safety of our food — will improve the health of almost every American. Cleaner energy sources and more efficient use of energy will lead to healthier air for children and adults to breathe. Improving the design of our cities and towns in ways that make it easier and safer to get around on foot, by bike, and on mass transit will reduce the number of cars on our roads and will help people become more physically active and lose weight. Increasing our consumption of fruits and vegetables, and reducing our intake of meat — especially beef — will help people maintain a healthy weight, will help prevent heart disease and cancer, and will play an important role in limiting global warming.

Conclusion. Peoples' health is dependent on the health of the environment in which we live. Global warming offers America an opportunity to make choices that are healthier for us, and for our climate.

3.1.2 Localize the issue.

Although the majority of Americans consider climate change a serious problem, they generally think of it in geographically and temporally distant terms [48]. This is likely because most Americans are not aware of the effects of climate change that are occurring here and now, including in their community.

Re-framing climate change as a public health issue can help reveal local angles of a global problem, thereby making the problem more concrete, and moving the location of impacts closer to home. To many people, the problem of climate change is global and abstract, while human health impacts are local and concrete. For example, large numbers of Americans believe that global warming will harm plants and animals (61%), future generations of people (61%), and people in developing countries (53%). Conversely, far fewer believe that global warming will harm themselves (32%), their family (35%), or people in their community (39%)[48]. In other words, people are more likely to perceive climate change impacts as a threat to plants and animals, to people in other parts of the world, and to future generations, but not as a local issue affecting themselves, their family, and their community.

National public health organizations should highlight the current impacts of climate change on human health in

each region of the country; state and local public health organizations, in turn, should localize this information to the extent possible. Risk communication research demonstrates that an individual's personal sense of risk is the most powerful motivator of behavioral change[61,62]; people are more likely to recognize and act on risks that are perceived to be close to home. This may be particularly relevant in encouraging public adoption of adaptation measures to avoid increased climate health risks. For example, references to droughts in the Southwest may resonate more with Americans than talking about droughts in Africa. Similarly, climate change becomes a more personal threat to a New Yorker when hearing how New York City's subway system will suffer as the result of a rise in sea level compared to hearing about the effect of a sea level rise in Bangladesh.

By framing climate change as a local public health issue, it is possible to replace people's mental associations of climate change as being geographically and socially distant with more proximate and relevant mental associations, such as the risks to children, the elderly, and the poor, in local communities, as well as across the United States and abroad. Americans who understand that climate change is harming people here in the United States (rather than only in nations far away) and now (rather than at some time in the future, if at all), are more engaged in personal actions and more supportive of climate change policies [48,59,63]. Therefore, a local focus on human health is likely to enhance — and sustain — public engagement in the issue of climate change and thereby facilitate meaningful public dialogue about the nature of the problem, our opportunities for solutions, and other ways in which we can benefit by taking action.

Not only does making climate change a local health risk engage the public, studies reveal that it may also engage journalists as well. For example, Nisbet and colleagues [35] found that when experts and their institutions pursued basic media agenda-building strategies focused on public health threats, especially when localized, the strategies lead to substantive reporting. These strategies include the release of a locally or regionally tailored study or report; the sponsorship of regional meetings; or a news conference on the part of a public health-related coalition or professional group.

3.1.3 Emphasize the immediate health benefits — i.e., the "win-wins" — associated with taking action.

Many actions taken to address climate change create "win-win" situations in that — in addition to helping

Spotlight On
How Three States are Localizing the Issue

The Minnesota Department of Health's website is designed to provide individuals with climate change-related information for both the United States as well as Minnesota, bringing the threat of climate change closer to home. This is an important aspect in encouraging public adoption of adaptation measures to avoid increased climate health risks.

http://www.health.state.mn.us/divs/climatechange/minnesota.html

The California Department of Public Health (CDPH) has developed a PowerPoint presentation that illustrates the current and impending dangers of climate change in two specific areas of the state.

http://www.cdph.ca.gov/services/boards/phac/Documents/Climate-Change-Health-PHAC-012909.pdf

The New York State Energy Research and Development Authority commissioned an integrated assessment study titled Responding to Climate Change in New York (2010) in which public health impacts and adaptation measures are clearly identified.

http://www.nyserda.org/programs/environment/emep/climate_change_newyork_impacts.asp

Spotlight On
How the Federal Government is Regionalizing the Issue

In 2009, the U.S. Global Change Research Program – a branch of the federal government that coordinates climate change research across all federal agencies — produced a comprehensive synthesis of climate change impacts that have already manifested in the U.S., and of further impacts that are projected to manifest in the U.S. over the coming decades. This excellent report examines climate change impacts both for each region of the country, and for various sectors including human health, water, agriculture, and ecosystems. Every public health organization in the U.S. should familiarize itself with this important science synthesis.

http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts

address climate change — they immediately begin to create important public health benefits. Some of these "win-wins" relate directly to climate change and health. For example, urban reforestation helps limit the urban heat island effect, making cities safer for vulnerable people (and more pleasant for everyone) during extreme heat events, and thereby reducing heat deaths and illness.

Perhaps more importantly, many other "win-wins" associated with taking action against climate change are unrelated to the ways in which climate change can harm health. Rather, many steps taken to address climate change also work to reduce a number of America's leading causes of death and illness including obesity, physical inactivity, unhealthful diets, asthma, and other chronic conditions including heart disease and cancer, and transportation-related injuries and death. Programs and policies that make it easier for people to walk, cycle, and take public transportation, for example, create important climate, health, and quality of life benefits. Moreover, it is a veritable truism in communication that people tend to respond better to positive information than negative information [64]. Therefore, highlighting the health benefits associated with taking action against climate change — including benefits that have nothing to do with climate change per se — is a useful way of accentuating the positive, giving people important additional reasons to support helpful programs, policies, and individual actions.

In response to the health-framed essay about global warming reprinted above, for example, most participants in all six audience segments responded positively to information about the health benefits associated with taking action against climate change, even those who were unconvinced that climate change is happening [54]. These health benefits included cleaner air to breathe and cleaner water to drink, healthier food to eat, fewer cars on the road, and more pedestrian- and bicycle-friendly communities. Another study — conducted by the CDC (2010) — also found that individuals embraced information about climate change that used a health co-benefits frame because recommended behaviors were seen as benefiting the individual as well as conveying specific messages about what the individual could do to mitigate the effects of climate change. A focus on the co-benefits of climate change prevention behaviors contain messages that convey the ways that climate change-mitigating behaviors — such as driving less, eating less processed food, and using energy saving light bulbs — can have benefits like reduced stress, improved health, and cost savings.

Thus, public health officials should specifically emphasize the immediate — or near-term — health benefits ("co-benefits") associated with climate change adaptation and mitigation strategies. California's 2009 Climate Adaptation Strategy, for example, explicitly encourages public health officials to strive to institutionalize the inclusion of public health considerations in all applicable climate change policies.

Public health communicators also have important opportunities to emphasize the health benefits associated

Opportunities for Communicating Climate Change Health Messages

Highlighting the health benefits associated with taking action against climate change — including benefits that have nothing to do with climate change per se — is a useful way of accentuating the positive, giving people important additional reasons to support helpful programs, policies, and individual actions.

See Appendix A for more findings from CDC's (2010) study: Framing climate change in terms of human health effects: Qualitative research study with emerging "green" opinion leaders.

with complementary policies and programs that are not specifically focused on climate change. For example, the American Lung Association in California has documented the significant public health gains that Californians will enjoy if their state implements the Vision California "mixed growth" and "growing smart" initiatives [65]. Specifically, the data show that the sustainable community and transportation development options proposed for the next two decades will help clean the air, reduce pollution-related illness and death, and avoid significant health cost — benefits that are broadly supported by all Californians.

Accentuating the positives by specifically highlighting the "win-wins" associated with climate action is not only a useful means of enhancing public engagement. It is also helpful to policy makers in that bringing the health co-benefits (and their monetary value) of potential climate actions to their attention can give them a clearer understanding of which policies and programs will benefit their communities in multiple important ways. Actions such as shifting to cleaner energy sources, facilitating safe public and active transport, and expanding affordable access to produce-based food choices, can create important health gains for individuals, families, and entire communities. These local and immediate benefits can offset costs of climate change mitigation, and provide a strong political and personal motivation for action. Mayors, for example, are more likely to make clean energy and active transport choices as a way to reduce urban air pollution [66] and improve citizens' health [67] than to reduce greenhouse gas emissions per se.

3.1.4 When possible, make or reinforce four key points:

1. Climate change is real and human caused.

Research has shown that people who fail to understand (or to accept) these facts — facts that are endorsed by approximately 95% of the world's leading climate scientists [7,8] — are less likely to take actions, and less likely to support policies that will reduce the human harm associated with climate change.

Public health communicators need not necessarily marshal climate science per se to make the case that climate change is real and human caused. Rather, they can invoke the widespread agreement among the world's leading climate scientists. For example: Two recent studies have shown that approximately 95% of active climate scientists are convinced that the planet is warming as a result of human activity. One of these studies is based on a large survey of climate scientists [7], and the other is based on an analysis of the conclusions in published, peer-reviewed journal articles [8].

Some people are reluctant to accept the widespread agreement of "experts" on this point; they often point to other scientists who purportedly do not concur with the consensus view. A health care analogy can be useful in helping people understand that we often find it wise to act when there is widespread agreement among experts, even if a few experts remain unconvinced. For example, if 95% of the world's leading pediatricians agreed that a given child was seriously ill, most parents would likely decide to act on that diagnosis, rather than take the advice of the 5% who counsel them to do nothing.

2. Climate change is bad for us and for our community in a number of ways.

As discussed earlier, climate change is expected to both directly and indirectly adversely affect the health of all

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Spotlight On
Several Urban and Rural Counties that are Creating "Win-Wins"

In San Diego County, public health officials — in collaboration with a broad based collaborative (including the business community, schools, etc.) that is creating the county's climate action plan — is developing active commuter transportation opportunities, comprehensive transportation policies, regional bikeway signage to promote active transportation, and promoting countywide safe routes to schools.

http://sdpublic.sdcounty.ca.gov/

The PLACE Program — in Los Angeles County, California — focuses on land use and transportation policies that increase physical activity and non-motorized travel, improving public health outcomes.

http://www.publichealth.lacounty.gov/place/index.htm

The Humboldt Partnership for Active Living — in largely rural Humboldt County, California — provides an example of an active transportation program that is improving public health outcomes and reducing energy use and heat trapping pollution emissions. The program hosts trainings and creates tools to identify and reduce on-the-ground barriers to creating healthy communities (i.e., tools to help decision-makers design and implement healthy policy).

www.humpal.org/

Americans [13]. In fact, many communities across the United States are already experiencing the negative direct health effects associated with climate change [16].

Recent warming in the Southwest region of the United States is among the most rapid in the nation, significantly more than the global average in some areas. Warming is likely to make it more challenging to meet air quality standards necessary to protect public health. Thus, the magnitude of projected temperature increases for the Southwest, particularly when combined with urban heat island effects for major cities such as Phoenix, Albuquerque, Las Vegas, and many California cities, represent significant stresses to human health in a region that already experiences very high summer temperatures [15]. For example, Californians currently experience the worst air quality in the nation. More than 90% of the population lives in areas that violate state air quality standards for ground-level ozone or small particles. These pollutants cause an estimated 8,800 deaths and over a billion dollars in health care costs every year in California [68].

The excess illnesses and deaths that are projected to occur due to climate change — including those from extreme weather events, exacerbation of respiratory and other chronic conditions, and food-, water-, and vector-borne diseases — are significant, and need to be taken seriously. Potentially more serious, however, are climate change related threats to human health that could come from experiencing climate "tipping points" (such as a rapid collapse of ice sheets in Greenland or Antarctica) or the gradual build-up of pressure on the natural, economic, and social systems that sustain health [9]. These events and their likely consequences — including economic deprivation, population dislocation, and civil conflict — are less certain to occur, but should they occur, they're likely to be highly destructive to human health and wellbeing.

3. *We need to start taking action now to protect the health of our community's most vulnerable members — including our children, our seniors, people with chronic illnesses, and the poor — because our climate is already changing and people are already being harmed. [Our top priorities for protecting people's health from our changing climate are (list your organization's top three priorities here).]*

When climate change is framed as a public health issue, adaptation — i.e., protecting people's health from the changing climate — becomes an important and unavoidable part of the story. The specific climate-related risks to health vary by region, but the proximal causes in most communities include more extreme storms, floods and storm surges, heat events, air quality (i.e., ground level ozone) disruptions, wildfires, vector-borne diseases, and allergic reactions.

To prevent people from being harmed by such events — which are caused by unavoidable changes in their climate — communities must take adaptive actions. These adaptation actions are inherently local; engaging citizens in considering them, prioritizing among them, and making plans to implement them are highly concrete ways that public health officials can help a community focus on what it can do to respond to the changing global climate. Thus, a focus on adaptation can help move the community dialogue about climate change from the realm of global abstraction, to the realm of local reality.

Recent public opinion research by The San Diego Foundation indicates strong support for regional leaders to plan for and address the impacts of climate change on people's quality of life [69]. This support among 72% of voters spreads across demographic lines, including

Spotlight On

Philly's Success in Saving the Lives of Vulnerable People During Heat Waves

In the mid-1990s, Philadelphia became the first U.S. city to implement a system for reducing the risk of death during heat waves. The city focused its efforts on the elderly, homeless, and poor. During a heat wave, a heat alert is issued and news organizations are provided with tips on how vulnerable people can protect themselves. The health department and thousands of block captains use a buddy system to check on elderly residents in their homes; electric utilities voluntarily refrain from shutting off services for non-payment; and public cooling places extend their hours. The city operates a "Heatline" where nurses are standing by to assist callers experiencing health problems; if callers are deemed "at risk," mobile units are dispatched to the residence. The city has also implemented a "Cool Homes Program" for elderly, low-income residents, which provides measures such as roof coatings and roof insulation that save energy and lower indoor temperatures. Philadelphia's system is estimated to have saved 117 lives over its first 3 years of operation.

[Reprinted from USGCRP (2009).]

conservative and liberal, young and old, new and longtime citizens. Additionally, 77% of voters believe actions taken now could lead to a stronger economy and more clean energy and clean technology jobs — something at the forefront of everyone's mind — while sustaining our clean environment.

4. Taking action creates a "win-win" situation for us because, in addition to dealing with climate change, most of these actions will benefit our health too.

Many of the policy options that are helpful in reducing production of heat-trapping pollutants (such as powering our cities, homes, and cars with clean renewable fuels rather than dirty carbon-based fuels; reducing transportation fuel use by making it easier for people to move around their communities on foot, and by bike and public transportation; and making it easier to eat a diet rich in fruits and vegetables) are also helpful in enhancing our health (by cleaning our air and water, allowing us to be more physically active, and helping us eat more healthfully). Moreover, the direct societal benefits from improved public health associated with these measures can offset some of the costs associated with taking these actions [9].

3.1.5 Use the fundamentals of good communication.

When communicating, take advantage of techniques that capture people's attention and enhance the odds of influencing people's actions [70]. Chip and Dan Heath — in their excellent book *Made to Stick* [71] — offer the SUCCES acronym as a guideline: keep it *simple*; make your point in an *unexpected* manner; give *concrete* examples; use *credibility* to your advantage; allow *emotion* to accentuate the message; and bring the message to life by telling a *story* about how the issue has affected real people. Health Canada [72] has a very useful climate change and health communication resource titled "Communicating the Health Risks of Extreme Heat Events: Toolkit for Public Health and Emergency Management Officials." The toolkit further suggests avoiding a

> ### Tailored Extreme Heat and Health Fact Sheets
>
> The U.S. Environmental Protection Agency (EPA) has developed fact sheets on risks to health from extreme heat that are tailored to the needs of specific target audiences. The "It's Too Darn Hot" fact sheet is offered in 17 languages and comes in two versions — the high-literacy version and a simpler version for those with a lower reading ability. EPA also offers a large-font series of fact sheets for people with a visual impairment.
>
> *Source: www.epa.gov/aging/resources/factsheets/index.htm*
>
> [Reprinted from Health Canada (2011).]

litany of common communication mistakes including: use of technical jargon, unnecessary words, judgmental statements, promises or guarantees, and the use of humor that can be misunderstood. The Health Canada guide also suggests that, when helpful and feasible, messages should be tailored to meet the needs of specific target audiences. They point to the "It's Too Darned Hot" fact sheets on extreme heat events — produced by the U.S. EPA — as a good example.

> ### South Heartland District Health Department: The Director's Dilemma
>
> **A comment contributed by Michele M. Bever, PhD, Executive Director**
>
> The South Heartland District Health Department serves a population of nearly 48,000 in four counties (2,289 square miles) of south central Nebraska — the largest community is Hastings, a city of 25,000. Rural and agriculture-based (corn, soybeans, wheat, cattle, hogs), the area is fortunate to house a private liberal arts college, a community college campus, and a national research facility, the Roman L. Hruska U.S.D.A. Meat Animal Research Center. Major industries and employers across the region are related to agriculture or food distribution, health care, and education. Because of Nebraska's dependence on agriculture, the economy of the region is closely related to weather patterns. In past years, drought, heat-stressed crops, irrigation restrictions, and rising irrigation costs have reduced **>>>**

farmers' profits in many areas of Nebraska, including the South Heartland district. Self-reliance and a "pioneer spirit" are strong, but people also look after each other.

South Heartland, the district health department that serves this area, has only 10 staff FTEs and is not yet 10 years old. The department's current 5-year public health improvement plan (developed out of the MAPP community needs assessment process) does not include a priority on climate change. Furthermore, the "temperature" of local public opinion on global warming topics has not yet been measured, although the director is convinced that public health should have a role in monitoring the impacts of climate change as well as promoting public preparedness for climate change. Against this backdrop, the department realizes that it does not have the mandate, the staff, or the resources to develop a formal initiative to address climate change from the public health perspective.

Hence, overt communication about climate change has been limited. The department focused on climate change for one of their monthly public health columns in recognition of National Public Health Week 2008 and more recently has initiated discussions specifically regarding climate change with a few potential partners. For example, South Heartland met with the local National Weather Service office staff to discuss monitoring climate change (what local data might be available, can it be shared?) and how the two agencies might partner to prepare the regional population for responding to severe weather or extreme heat events. An informal report on that meeting was shared with one county's Local Emergency Planning Committee (LEPC), a group whose members include representatives from local government, emergency management, law enforcement, fire and rescue, businesses, National Weather Service, and public health.

On the other hand, there are many local public health activities that are priorities to the health department and that happen to have co-benefits for climate change mitigation or adaptation. The department's health surveillance and disease investigations include tick-borne, mosquito-borne, food-borne, and water-borne illnesses and risks. Syndromic school surveillance allows the department to track trends in student absences due to illness, including asthma. The department works with media to provide tips for weathering extreme heat or cold events and local emergency management agencies have processes in place for setting up cooling centers or encouraging people to visit retail stores, such as Wal-Mart, for relief from the heat. With support from emergency preparedness and pandemic planning funds, the department works on emergency planning and health education with vulnerable populations.

School and work place wellness initiatives, as well as healthy community initiatives with other partners in the public health system, are high priorities for reasons of health and economic improvement. Climate change mitigation or adaptation could be attached to many of these as a co-benefit. Examples include promoting daily physical activity through Safe Routes to School programs or the community Pioneer Spirit Trail system of walking/biking paths. In addition, community gardens, farmers markets, and "go local" marketing in grocery stores are components of nutrition promotion, obesity prevention, and economic development initiatives. The natural resources districts, utilities, agriculture producers, and public health are partnering to reduce nitrates in drinking water by promoting water conservation and best management techniques in agriculture and lawn care.

The "Are We Ready" report [27] states that most public health directors think climate change is already impacting their jurisdictions but that they don't have the resources to address it. From South Heartland's perspective, public health is already (indirectly) addressing climate change, but the human health "co-benefits" of the actions that help limit climate change and help us adapt to it are actually the primary goals that are driving public health activities, with climate change implications as "co-benefits".

So, while the South Heartland District Health Department has not overtly connected "climate change" or "global warming" to the work they or their partnering agencies do, much of the work that has climate change adaptation or mitigation co-benefits is already supported in the eyes of the public because of the personal and public health benefits, or for the local economic benefits. South Heartland's director is grappling with when or if the department should begin communicating these links. Will drawing attention to these connections with climate change be embraced by the public or result in new barriers to action on current public health priorities? There may be certain target audiences (perhaps local decision-makers or other partners?) that could benefit from the knowledge that public health's "health in all policies" approach includes communication about and response to climate change issues.   >>>

3.2 Getting the message out

3.2.1 Strengthen the knowledge base — and the ability to work across program areas — within your own health department.

Public health organizations' own employees, regardless of their job title, are a vital yet often overlooked channel of communication about important public health issues. Strengthening the knowledge base about the public health relevance of climate change within public health organizations is an important place to begin the public outreach process. Staff development activities on climate change will also strengthen your organization's ability to deal with climate change by encouraging collaboration across program areas.

3.2.2 Create a section — or simply post information — on your website about climate change and human health.

Your website is an invaluable source of information for your employees, and for many important stakeholders in your community (including the news media). It presents an important opportunity for your organization to help both internal and external audiences understand the relevance of climate change to the health and wellbeing of people in your community.

Credible, public access information that your organization can use to explain the public health relevance of climate change can be found online in a variety of places, including:

- ASTHO: http://www.astho.org/Programs/Environmental-Health/Natural-Environment/Climate-Change-and-Public-Health/

- CDC: http://www.cdc.gov/climatechange/

- EPA: http://www.epa.gov/climatechange/effects/health.html

- NACCHO: http://www.naccho.org/topics/environmental/climatechange/

Spotlight On

Orange County, Florida's Successes in Strengthening Public Health Capacity

To strengthen the knowledge base within their organization, the Orange County Health Department (OCHD) prepared an online presentation for employees. The presentation included health effects, disease surveillance, and OCHD's role in addressing climate change. An evaluation showed that 82% of OCHD employees participated in the training, and enhanced their knowledge. Moreover, the post-test evaluation identified further knowledge gaps that will become the focus for future training and professional development activities.

http://www.orchd.com/environmentalHealth/ClimateChange/HealthEffectsClimateChange.pdf

OCHD has also identified opportunities for various programs within the health department to collaborate in addressing climate change. Their public information office is focused on getting out the message about the health effects of climate change, while their epidemiological and nursing units are tracking emerging diseases potentially related to climate change. They are also producing GIS maps — showing flood zones, poverty levels, WIC clients, mosquito target areas and access to fresh food — to identify the areas and populations most likely to be affected by climate change. This information has been shared widely with other program areas throughout the health department.

http://www.orchd.com/environmentalHealth/documents/heatindex2.pdf

- NIH: http://www.niehs.nih.gov/health/assets/docs_a_e/climatereport2010.pdf
- WHO: http://www.who.int/globalchange/en/

Creating a climate change and health blog on your website can provide an additional means to highlight local angles, pose questions about how your community should adapt to climate change, and track developments — such as newly released research, climate action plans, or local adaptation efforts — in real time.

Some examples include:

- Age of Engagement: http://bigthink.com/blogs/age-of-engagement
- Climate 411: http://blogs.edf.org/climate411/
- Climate Change, Family Planning, and Reproductive Health: http://www.populationaction.org/blog/2009/12/climate-change-family-planning.html
- Climate Health: http://climatehealth.wordpress.com/
- Climate Science Watch: http://climatesciencewatch.com
- DeSmogBlog: http://desmogblog.com/
- Dot Earth: http://dotearth.blogs.nytimes.com/
- Public Health Matters: http://blogs.cdc.gov/publichealthmatters/
- Real Climate: http://www.realclimate.org/
- Skeptical Science: http://www.skepticalscience.com/

3.2.3 Contact news media outlets in your area.

Health news is a perennial favorite of news outlets, including newspapers, television, radio, and online. The climate change and health story — especially to the degree that it can be localized — has considerable potential to interest local news outlets. Briefing the editorial board of your local paper, local TV and radio producers, local weathercasters, and prominent local bloggers are all potentially helpful options. Longer lead-time options include contacting public radio and other talk radio producers, letting them know of your interest in speaking to this issue, and volunteering to speak at local public policy forums or university symposia.

3.2.4 Partner with other local organizations to draw attention to the health impacts related to climate change.

Framing climate change as a public health issue creates opportunities to engage important new partners in the issue who, in turn, can help explain the issue to

Spotlight On
San Luis Obispo County, California's Simple Use of their Website

On their website you can find recent copies of the County of San Luis Obispo Public Health Bulletin, which is published on a quarterly basis. The Public Health Bulletin includes Notes from the Public Health Officer, updates on recent events of Public Health concern, announcements, and a summary of reported cases of selected communicable diseases. The winter 2011 issue features an article on the human health implications of climate change.

http://www.slocounty.ca.gov/health/publichealth/bulletins.htm

Spotlight On
Orange County, Florida's News Media Outreach

To inform the public about the health effects of climate change, the OCHD sent out a press release to local news media that led to a 20-minute radio interview.

[See Appendix B for the OCHD press release.]

Additionally, they released a video featuring local, state, and federal public health officials discussing the impact of climate change on health through its impact on air and water, nutrition, and diseases. The health department is partnering with the Orange County Division of Environmental Protection to show the educational video — at a permanent kiosk running a continuous video loop — at the Orange County Convention Center, which has the potential to reach 1.4 million attendees. They have also secured a verbal commitment from Orange TV, the county's TV station, to broadcast the video through local cable providers.

http://www.orchd.com/absolutenm/templates/videos.aspx?articleid=194&zoneid=18

the public and decision-makers, and who can help develop and implement response plans. Protecting human health is an issue that crosses institutional, scientific, and political boundaries. A focus on improving health is an important way to humanize the issue of climate change, and to encourage cross-cutting collaborations across communities.

Myriad types of organizations that are active on climate change to a greater or lesser degree are potentially interested in learning the public health perspective on climate change, and potentially interested in partnering with public health organizations to develop solutions. These include traditional public health partners (e.g., local government and agencies, hospitals, health plans, clinics and health care providers, American Lung Association) as well as newer or non-traditional partners (e.g., land use and environmental groups, transportation, science museums, economic development and social justice, faith-based groups, school districts and educational groups, community oriented and equity organizations).

3.2.5 Use regional meetings to create news attention.

Evidence suggests that in the few instances when government agencies have sponsored regional meetings featuring experts discussing localized climate change impacts, these meetings trigger subsequent coverage of public health consequences. For example in 1997, in the months leading up to the Kyoto summit, the EPA sponsored a meeting in Dallas, Texas on climate change impacts specific to the state. The *Houston Chronicle* followed with a news report that focused on the risks related to heat waves, infectious diseases, severe storms, and coastal flooding [73]. Similarly, in 2007, when the EPA sponsored a meeting in Houston titled "Climate Change: What Does It Mean for the Midwest?," the *Chronicle* reported that a hotter, wetter Midwest would lead to risks from severe flooding and contribute to problems related to allergies and asthma [74].

3.2.6 Issue coalition statements that frame news coverage.

Coalition building and media-lobbying efforts on the part of public health professionals have been shown to frame news coverage on important issues such as climate change. For example, at the Kyoto treaty meetings in 1997, 400 physicians joined with health experts from 30 countries and the editors of the leading medical journals to warn that climate change would lead to deaths or illness from the increased incidence of heat waves, severe storms, and/or infectious disease. The press conference led to a news story filed by the *Houston Chronicle's* reporter at the meetings [75] and was coordinated with a full-page advertisement purchased at *The New York Times*. In a second example, a 2007 metro section *Washington Post* article featured the headline: "Nurses Warm to Campaign Against Climate Change,

Spotlight On
Collaboration Between Earth Science and Public Health Organizations

In February 2010, the American Meteorological Society (AMS) and the American Geophysical Union co-hosted a briefing in Washington, DC that featured presentations by three leading experts — Drs. Rita Colwell, Howard Frumkin, and Jonathan Patz — on the health effects of climate change, and the best ways to mitigate these effects. The presentations are archived on the AMS website for use by earth scientists, public health professionals, policy-makers, and other interested stakeholders.

http://ametsoc.org/atmospolicy/climatebriefing/feb2010.html

Spotlight On
"Lunch and Learn" Presentations

Presentations — such as this "lunch & learn" PowerPoint created by Ed Maibach — can be used at local or regional meetings to convey the human health implications of climate change.

http://www.climatechangecommunication.org/publichealth.cfm

During National Public Health Week (NPHW) 2008, the American Public Health Association created a "partner toolkit" designed to facilitate the planning of NPHW 2008 activities. The materials in this toolkit can help you overcome any initial hesitation you might have about approaching the media. Specifically, you will find various tips for working with the media, including help with how to speak to the media, as well as sample media templates.

http://www.nphw.org/nphw08/NPHW%20toolkit%202008.pdf

Public Health Practitioners See Reducing Carbon Dioxide Emissions as Good Preventative Medicine" [76]. The article was triggered by a news conference organized by Environment Maryland which featured 20 nurses who discussed the linkages between climate change and the risk from extreme heat in cities such as Baltimore.

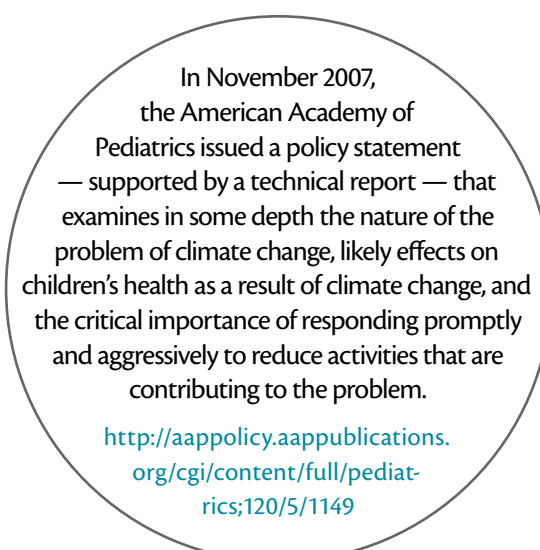### 3.2.7 Write opinion-editorials and guest columns that reach readers directly.

Success at placing opinion-editorials creates important communication opportunities in that op-eds are often read by a broad cross-section of the community, including and perhaps especially community "influentials" (i.e., policy makers and the people who influence them). As such, they frequently lead to additional public discussion of the content (e.g., on talk radio, in community meetings, etc.). Over the past decade, Dr. Paul Epstein [77,78] has had success in publishing climate change and health op-eds in national newspapers (*The Washington Post* and *New York Times*), and he and the current President of the AMA, Dr. Cecil Wilson, recently published an op-ed in *The Huffington Post* [79]. Despite the obvious benefits of this approach to getting the message out (i.e., no cost; high impact), a recent review of climate and health coverage in two national and four local newspapers found that Dr. Epstein's op-eds were the only published op-eds on the topic [35]. It would appear, therefore, that this is an opportunity waiting to be cultivated in local papers around the nation.

3.2.8. Issue a scientific report or study on local/regional health impacts and cultivate press coverage.

Research on the "agenda-setting" effect of the media has provided overwhelming evidence that the issues portrayed in the media subsequently shape the issue priorities of the public, determining the problems that the public perceives as the most pressing and most important [80,81]. The agenda-setting influence of the media is relevant to collective action on the health impacts of climate change in two fundamental ways. First, if U.S. communities are going to invest in mitigation and adaptation efforts, climate change health risks need to be perceived as a higher priority by professionals, policy makers, and the public. Increased news attention to health impacts is likely to be a significant contributor to the agenda status of the problem in state houses, federal and state agencies, and Congress.

In November 2007, the American Academy of Pediatrics issued a policy statement — supported by a technical report — that examines in some depth the nature of the problem of climate change, likely effects on children's health as a result of climate change, and the critical importance of responding promptly and aggressively to reduce activities that are contributing to the problem.

http://aappolicy.aappublications.org/cgi/content/full/pediatrics;120/5/1149

One way to garner media attention on the issue of the human health effects of climate change is to issue scientific reports or studies on the topic. In 2000 and 2009 respectively, Federal inter-agency reports assessing the regional impact of climate change in the U.S. generated substantive coverage of public health threats. For example, the 2009 report triggered focus at *The New York Times* [82] on heat-related illness, asthma, and other respiratory problems. In a second example, the *Houston Chronicle* used the inter-agency report as the news peg to run a front page feature [83] and an editorial (2009) localizing the health consequences of climate change for its readership, focusing on the increased risks from severe hurricanes, dangerous flooding, and extreme heat.

The 2000 inter-agency report also had similar success in generating substantive coverage of public health-related impacts. For example, coverage at *The Washington Post* described the threat of heat-related deaths in the Midwest and vector-borne disease across the country [84]. *The Milwaukee Journal Sentinel* alternatively focused on the increased risk of heat waves and extreme flooding in the Midwest [85].

3.2.9 Develop contexts and opportunities for communities to discuss, learn, connect, and plan.

Apart from increasing news attention, it is also important to sponsor face-to-face and/or web-based interactive contexts where experts, stakeholders, and the public can come together to discuss, plan, and learn about the risks and responses to climate change. In these public forums or meetings, invited or recruited participants receive background materials in advance, and provide input on the types of questions they would like addressed at the meeting. Importantly, public forums should not simply involve a single expert lecturing to an audience about climate

change, but should be structured around presentations from a diversity of experts and stakeholders, followed by facilitated discussion among attendees that results in structured feedback to forum organizers [86].

Through participation in these types of public forums, research finds that not only do individuals learn directly about the technical nature and risks of an issue such as climate change, but they also learn about the social, ethical, and economic implications [86,87]. A second key outcome of public forums is that participants also feel more confident and efficacious about their ability to effectively take action and/or participate on the issue, they often perceive relevant institutions such as public health organizations as more responsive to their concerns, and they say that they are motivated to become active on the issue if provided a future opportunity to do so [87].

In addition, these public consultation initiatives should also be conceived of as informal mechanisms for "democratizing" decisions related to climate change and the management of related risks [88,89]. In particular, preparing for climate change will require the identification and consideration of matters related to ethics, values, equity, social justice, and economic trade-offs. Public consultation initiatives, by localizing discussion and focus, also have the potential to lessen the partisan and ideological differences over policy that commonly occur in national-level news and policy debate. Recent deliberative exercises on climate change provide models for structuring and sponsoring forums that achieve the above goals. These forums were also successful in minimizing the influence of extreme dismissive views or misinformation (see below World Wide Views on Global Warming).

Spotlight On

Health Departments as Conveners of Community Dialogues

In 2010, OCHD co-hosted two community dialogues on climate change: the 3rd Annual Climate Change Summit (with the University of Central Florida), and an educational workshop on climate change (with the Florida Department of Health and 1,000 Friends of Florida).

www.orchd.com

In November 2010, CDPH sponsored Climate Change Communication workshops for local health department staff in Southern and Northern California. The workshops provided practical advice on communicating the public health relevance of climate change, and engaged local health department personnel in dialogue about how to address the issue through regional collaboration.

www.cdph.ca.gov

World Wide Views on Global Warming

The Danish Board of Technology developed the idea for World Wide Views on Global Warming as a response to the emerging democratic gap between global policy makers and citizens, as more decisions become global in scale. WWViews took place in September 2009 and involved roughly 4,000 citizens in 38 countries spanning six continents. The citizens gathered in their respective nations to deliberate about the core issues at stake in the December 2009 United Nations negotiations on climate change (COP-15). They received balanced information about climate change, discussed with fellow citizens, and expressed their own views.

http://www.wwviews.org/
http://www.tekno.dk/subpage.php3?article=1718&toppic=kategori11&language=uk

3.2.10 Use social media to encourage public participation in the dialogue.

Other initiatives should be used to bridge and expand the connections between news coverage and community conversations about climate change. First, no matter how effective news agenda-building strategies might be, the economic decline of newspapers will become an increasing barrier to quality coverage of climate change. Financial pressures in the news business in general, and the newspaper business in particular, have forced cut backs in locally-tailored coverage of issues related to sustainability, the environment, energy policy, and public health [90].

A method for augmenting reduced capacity at local newspapers is to launch government and foundation-supported digital news communities that cover issues related to energy, sustainability, and public health as they relate to a specific city or region. These digital news communities can include original reporting and professionally edited news content, features, and commentaries along with a range of user-generated and social media functions. This

content can also be shared and distributed to partner organizations in the region such as public media organizations and/or the local newspaper.

Importantly, a digital news community's "top down" news focus on energy, sustainability, and public health can be complemented and enhanced by a "bottom up" generated discussion among a variety of users, who share experiences, expertise, and insight on needs, risks, interventions, and health-related adaptation strategies. A digital news community can also eventually serve as the central information hub for a regional engagement campaign on climate change and related issues. Much of the overall engagement campaign's "brand" would focus in part on creating awareness, traffic, and use of the site. Interpersonal connections forged at face-to-face or web-based public forums can be strengthened and expanded by using the digital news community, as attendees find out about events via the site and then continue their conversations online [37,91,92].

3.2.11 Identify, recruit, and train opinion leaders.

Perhaps the most effective way to connect with and engage difficult-to-reach audiences both in face-to-face and online conversations is to identify, recruit, train, and support informal opinion leaders [93]. For more than sixty years, researchers have traced the influence of news and advertising messages in local communities, identifying a small group of opinion-leading individuals who pay close attention to public affairs and advertising, and who discuss what they learn from the media with a diversity of others, thereby informally influencing others to adopt an opinion or course of action [94]. In this "two step-flow of information," opinion leaders do not necessarily hold formal positions of power or prestige, but as highly socially-networked individuals existing within almost every segment of the public, they serve as the connective communication tissue that cues their peers about how to interpret political events, social issues, and consumer choices [95]. Over the past decade, as audiences have become more difficult to reach and less trustful of the media, opinion-leader strategies have become increasingly important in public health, politics, and consumer marketing [96].

Several validated measurement techniques exist for identifying individuals with opinion-leader-like qualities in surveys and questionnaires. Opinion leader recruitment and training programs have demonstrated some remarkable successes in promoting public health and improving health care delivery [97]. Once recruited and trained, carefully designed messages about climate change can be matched to the information needs of a particular opinion-leader's network of friends and co-workers. These information needs can be identified using micro-targeting data, cluster analysis, or other market segmentation techniques. The messages should also be adapted for purposes of either face-to-face dissemination or digital delivery by way of email or social media sites [96].

> Social media sites such as Facebook and Twitter can easily be linked to your organization's webpage. And, by implementing an effective feed strategy, you post only once, and your content is automatically distributed to your various social media accounts. Facebook and Twitter are also increasingly being used to increase and coordinate turn-out to public meetings.

Climate Change Webinars

The American Public Health Association is hosting a 2011 Webinar Series on climate change and public health in collaboration with CDC, NACCHO, ASTHO, and NEHA. The focus is on state and local public health practices, and how public health tools can be used to enhance the capacity of state and local health departments in addressing climate change. Dates and registration information can be found online.

APHA is also currently working on releasing "Climate Change: Mastering the Public Health Role," a practical guidebook based on the 2010 Webinar Series that brought together experts in the field of climate change to discuss topics such as climate science, health risk communication, adaptation strategies, and more. This guidebook is a translation of a six-part webinar series hosted by APHA and the CDC, and is intended to be a useful tool for public health practitioners. The guidebook will be available online later this year.

http://www.apha-environment.org/

Relevant applications and lessons for climate change initiatives can be taken from the digital organizing strategies used by the Barack Obama presidential campaign. Launched in 2007, the My.BarackObama.com platform is a Facebook-like site that not only helps the campaign communicate with supporters and raise money, but it is also designed to help supporters connect with one another, organizing events in their local community. Perhaps the most innovative strategy for combining digital tools and face-to-face opinion leadership was the campaign's creation of an Obama iPhone application. The interface organized friends and contacts by key battleground states, encouraged users to call their friends on behalf of Obama; provided information on local events; and included videos and issue backgrounders that users could reference or show during face-to-face conversations with friends. The application also provided feedback data to the campaign, such as the number of phone calls successfully completed [96,98].

3.2.12 Request permission to testify at routine city/county council meetings and dedicated public hearings on relevant projects (e.g., transportation projects, housing projects, etc.).

The need to include a public health perspective on climate change will often be overlooked at relevant community and government hearings, precisely because the public health community has not typically been a leading voice in public deliberations about climate change thus far. Hearings of this type create a golden opportunity to share a public health perspective on climate change with a full range of stakeholders including most, if not all, of the stakeholder groups identified in Chapter 2 of this primer. Therefore, tracking when relevant public hearings are scheduled, and requesting permission to present a public health perspective at the hearings, creates a low-cost, potentially high-impact communication opportunity for public health organizations.

Conclusion

As we have reviewed in this primer, public health professionals are uniquely qualified and professionally obligated to engage the public and other stakeholders in their communities on the health risks posed by climate change and the actions that can be taken to adapt to and manage these risks. To do so, public health professionals need to understand the causes and inter-connected impacts of climate change on health and the appropriate range of responses. They also need to identify their most important partners in preparing communities for these risks, including members of the public (especially the most vulnerable), other groups of professional, journalists, and decision-makers.

To effectively engage and collaborate with these stakeholders, research and experience suggests that public health officials should make effective communication a priority. As we have reviewed, this includes: understanding audiences and framing information accordingly; creating opportunities for journalists to cover health impacts and to do so accurately; sponsoring innovative news and social media platforms that create and curate news and information on the topic; identifying and recruiting opinion leaders who discuss health impacts with others; and convening or participating in meetings, hearings, and other participatory forums where diverse stakeholders and members of the public can learn, discuss, plan, and participate in decision-making.

Appendices

Appendix A: CDC Study Poster

FRAMING CLIMATE CHANGE IN TERMS OF HUMAN HEALTH EFFECTS: QUALITATIVE RESEARCH STUDY WITH EMERGING "GREEN" OPINION LEADERS

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BACKGROUND

Climate change poses many direct and indirect threats to health, including injuries and fatalities related to severe weather events and heat waves, infectious diseases related to changes in vector biology, water and food contamination, and respiratory illness due to increased allergen production.[1,2,3,4]

Despite these potentially dangerous threats to health, the public views climate change primarily as impacting the environment. One reason for this is that the media frames climate change as an environmental issue rather than as a public health problem. [5]

To elevate the status of health into the dialogue on climate change, key stakeholders need to be engaged and educated. Framing climate change in terms of health effects, such as childhood asthma, common allergies, and food-borne illness, may make the complexity of climate change more personally meaningful to audiences. To this end, the Centers for Disease Control and Prevention (CDC) is interested in developing communication materials to increase awareness, knowledge, and preparatory behaviors for potential health effects associated with climate change. CDC identified three target audiences for this goal: lawmakers, community and faith-based organizations, and emerging green opinion leaders. Presented here are findings from a qualitative study with emerging green opinion leaders to identify the health issues and framing devices that would be effective for disseminating a public health frame message to this audience.

RESEARCH OBJECTIVES

Examine different ways of framing climate change in terms of health to make it meaningful to "emerging green opinion leaders."

Who are emerging green opinion leaders?

- Individuals who are concerned about climate change and have recently started engaging in environmentally friendly ways.
- They tend to be more affluent, educated, and civically active than the general population.
- They have the potential to educate others in their community.

METHODOLOGY

A multi-phased focus group study

Seven focus groups of 6-9 participants each with emerging green opinion leaders were convened in California.

- Three exploratory focus groups held in Sacramento
  - Discussed participants' impressions on climate change, knowledge about its health impact, possible civic actions to address the issue, and promising communication channels on this topic.
- Two message testing focus groups subsequently held in San Francisco and two in Los Angeles
  - Explored connections made between climate change and health.
  - Tested different message frames to encourage prevention and preparedness for the health effects of climate change.

Recruitment

Participants were screened for:

- One or more environmentally supportive behaviors adopted in the past three years (e.g., made home more energy efficient, used less gas as possible, punished companies with poor environmental practices, used reusable shopping bags, etc.).
- One or more civically active behaviors initiated in the past 12 months (e.g., written or called a politician, attended a public meeting on town or school affairs, served on a committee for a local organization, worked for a political party, etc.).
- At least a moderate degree to which they saw global warming as a serious issue: on a scale of 1-5 if they selected 3 or higher.

Screening questions to identify emerging green opinion leaders were adapted from Porter Novelli's Consumer Styles Survey[6] and Roper's ASW, Engagement Model of Opinion Leadership.[7]

Participant Demographics (n=56)

- An approximately equal number of men and women over the age of 18.
- Most with a college degree or more.
- Interested in climate change issues but not activists.

KEY FINDINGS

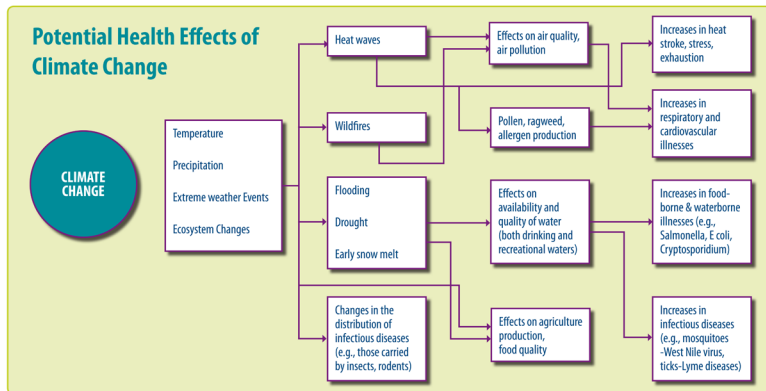### Exploratory focus groups

✔ **Barriers** to address climate change:

- Economic factors that limited ability to purchase energy-efficient consumer products;

  "Financially, I can't go and put in solar panels."

- Competing agendas among groups (e.g., governments, businesses, environmental organizations);

  "I believe it [climate change] some days. But . . . don't get correct information. It's confusing."

- Feeling of helplessness to make a difference to this global issue.

  "We have no control over what big companies do. . ."

- Mixed perceptions about immediate impact of climate change, though air quality and water shortage seen as primary problems in California.

  "I don't think that it's as acute an issue. I see it as a more long-term problem. And, I don't know if it's possible to fix."

✔ **Opportunities** for education:

- Limited knowledge acknowledged about the human health effects of climate change.
- Awareness of health effects primarily in reference to respiratory (e.g., asthma) and skin effects (e.g., cancer), with children and elderly recognized as most vulnerable.

Potential Health Effects of Climate Change

CLIMATE CHANGE

Temperature

Precipitation

Extreme weather Events

Ecosystem Changes

Heat waves → Effects on air quality, air pollution → Increases in heat stroke, stress, exhaustion

Wildfires → Pollen, ragweed, allergen production → Increases in respiratory and cardiovascular illnesses

Flooding / Drought / Early snow melt → Effects on availability and quality of water (both drinking and recreational waters) → Increases in food-borne & waterborne illnesses (e.g., Salmonella, E coli, Cryptosporidium)

Changes in the distribution of infectious diseases (e.g., those carried by insects, rodents) → Effects on agriculture production, food quality → Increases in infectious diseases (e.g., mosquitoes -West Nile virus, ticks-Lyme diseases)

- Mixed reactions to the diagram presented above
  > Thought to be an incomplete picture, as factors other than global warming believed to contribute to health.
  > Need for more information to understand health effects of climate change.
  > Information sources to be from credible organizations or people.
- Individual preparedness planning or adaptation strategies to address climate change seen as new ways of thinking.
  > Willingness to be part of preparedness and response planning.
  > Preference for joining an existing group rather than initiating an activity.

"How can you prepare if you don't know what is going to happen? Are you going to be under water or in a desert? You don't know how to prepare. You know how to prepare for a flood, but you don't know how to prepare for global warming."

✔ **Implications** for future messaging

- Develop message frames that:
  > Position health as co-benefit of engaging in environmentally supporting behaviors.
  > Provide concrete information about climate change effects on health and what people should do.
  > Involve the community in addressing the health effects of climate change.

Message Testing Focus Groups

Before the discussion—participants asked to prepare a collage of pictures or words to express thoughts on climate change

✔ Collages focused heavily on the natural world, with polar bears, glaciers, and smog figuring prominently.

Three message frames were tested with four to five message statements presented for each frame. An example of a statement for each frame is provided.

An **informational** approach focused on what could be "new news" to participants about the health effects of climate change.

> **INFORMATIONAL FRAME STATEMENT**
> **With climate change comes health problems for people.** Many problems have begun already—like more heat waves and more people with breathing problems like asthma. Over time, climate change will mean other health problems like less clean water, disease-carrying insects like ticks and mosquitoes in new parts of the country, and more extreme and destructive weather.

A focus on the **co-benefits** of climate change prevention behaviors contained messages that convey the ways that climate-change mitigating behaviors like drive less, eat less packaged food, use energy saving light bulbs can have benefits like reduced stress, improved health, and cost savings.

> **CO-BENEFITS FOR HEALTH FRAME STATEMENT**
> **Walk or bike—not just for the Earth, but for your health.** You care about the Earth, but you have to get to work, do your errands, and shuttle kids around. Look for ways to drive less—maybe carpool, take a bus, or map your errands. Better yet, walk or bike for your health and for the environment.

A focus on the **community** or relational aspect of climate change response and prevention.

> **COMMUNITY FRAME STATEMENT**
> **Work together to make life a little greener and help make everyone healthier and happier.** Whether you're at home, school, work, or someplace else, cleaning up the environment, planting trees, and taking small steps together to be greener in everyday life feels great. And, it means you are helping people to be healthier.

All three frames succeeded in moving participants to see climate change as a human issue as opposed to an issue only related to animals or features of the Earth.

- The co-benefits frame and the informational frame were most appealing and motivating

    > Co-benefits frame valued because Earth-friendly behaviors seen to benefit me and messages were specific about what to do.

    "Give me something I can grab on to then I'll do my part."

    > Informational frame focus was seen as a prerequisite to any behavioral change for it provided necessary information before considering any action. It was also seen to be the best at making the connection between climate change and health and personalizing the effects for participants.

    "I'm seeing our health related to climate change for the first time. Earlier I saw it affecting polar bears and other animals."

- The community frame, although seen positively, appealed specifically to only a few who were more civically active; others regarded it as a loftier type of appeal. *"If somebody organized these as an event, I would participate but the other two [frames] I can do myself."*

Participants discussed the most relevant and meaningful calls to action to respond to the impact of climate change on health:

Be part of an event at which people take steps to reduce climate change (e.g., plant trees).

Be part of an event at which people encourage policy change (e.g., ban plastic bags).

Talk to your family and friends about doing more to prevent climate change.

At the end of the discussion—participants reflected on their collages and mentioned changes to include:

Pictures about impact on people

More about health effect

More human-level issues

CONCLUSIONS

Framing the issue of climate change around health effects can be persuasive with emerging green opinion leaders when:

Messages provide concrete information to make the connection between climate change and health.

Co-benefits to a person's health are emphasized and actions to take are spelt out.

The issue is of relevance to their region.

They have an opportunity to participate in a local climate change mitigating event.

IMPLICATIONS

Future educational interventions on climate change to be informed by an integrated message framework that is informational, locally relevant, and with a focus on the co-benefits for health.

Findings similar to other recent research highlighting a new frame of reference for climate change effects on health that may broaden personal significance and relevance of the issue.[8]

Communication challenge of linking climate change to a particular health effect.

Limitation of qualitative study regarding lack of generalizability and hence need for quantitative data to assess information gap and measure future effectiveness of interventions.

[1]Haines, A., Kovats, R. S., Campbell-Lendrum, D., & Corvalan, C. (2006). Climate change and human health: Impacts, vulnerability and public health. *Public Health*, 120, 585—96.
[2]Patz, J. A., & Olson, S. H. (2006). Climate change and health: Global to local influences on disease risk. *Annals of Tropical Medicine and Parasitology*, 100, 535—49.
[3]Intergovernmental Panel on Climate Change. *Climate change 2007—working group II report: Impacts, adaptation and vulnerability*. Retrieved in December, 2009 from http://www.ipcc.ch/ipccreports/ar4-wg2.htm.
[4]Frumkin, H., Hess, J., Luber, G., Malilay, J., & McGeehin, M. (2008). Climate change: The public health response. *American Journal of Public Health*, 98, 435—45.
[5]Nisbet, M.C., Price, S., Pascual-Ferra, P. and Maibach, E. (under review). Communicating about climate change and public health: The news agenda-building challenge.
[6]Porter Novelli Worldwide. (2008). Profile: *Greenfluencers*. New York: New York.
[7]Keller, E. B., & Berry, J. L. (2003). *The influentials: One American in ten tells the other nine how to vote, where to eat, and what to buy*. New York, NY: Simon & Schuster.
[8]Maibach, E.W., Nisbet, M., Baldwin, P., Akerlof, K, & Diao, G. (2010). Reframing climate change as a public health issue: An exploratory study of public relations. *BMC Public Health*, 10,299. Retrieved from http://www.biomedcentral.com/1471-2458/10/299

Appendix B: OCHD Press Release

FOR IMMEDIATE RELEASE
Contact: Dain Weister

October 30, 2009
407-858-1429

OCHD SELECTED AS CLIMATE CHANGE DEMONSTRATION SITE

One of Six to Address Impact of Climate Change on Public Health

ORLANDO — The National Association of County and City Health Officials (NACCHO) recently announced that the Orange County Health Department (OCHD) received a $49,990 dollar grant to increase their staff capacity to address the public health consequences of climate change. OCHD joins only five other health departments nationwide for this initiative managed by NACCHO with funding from the National Center for Environmental Health (NCEH) at the Centers for Disease Control and Prevention (CDC).

"The health effects associated with climate change have the potential to impact public health here in Central Florida and in many places around the world. This grant will provide an opportunity to share these anticipated impacts with the public to help prepare and educate them for the challenges to come," said Dr. Kevin M. Sherin, Director of the Orange County Health Department.

Among other activities, each of the six local health departments will gauge the current capacity of their agency to address both acute and long-term ramifications of climate change and raise awareness of the effect of climate change on health within their agency. By working together with a coalition of community partners from various sectors including government, health care, and business, each health department will also develop a strategic plan for addressing the anticipated health effects of climate change.

With this grant, OCHD will increase public awareness of the health effects associated with climate change through a public education campaign, staff training, and expansion of collaborations to address climate change within the community.

"Climate change, with its potential for long-term heat waves and increased populations of disease-bearing insects, is a real threat to the health of communities," said Robert Pestronk, Executive Director of NACCHO.

In addition to OCHD, the other grantees are Imperial County Public Health Department (CA), Austin/Travis County Health Department (TX), Thurston County Public Health and Social Services Department (WA), Hennepin County Human Services and Public Health Department, (MN), and Mercer County Health Department (IL).

The Orange County Health Department strives for superior community health promotion, protection, and preparedness. The agency places special emphasis on health education, maternal and child health, epidemiology, environmental health, school health, dental care services, and a variety of other programs. The health department's mission is to promote, protect, and improve the health of all people in Orange County Florida. For more information, go to www.orchd.com.

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Appendix C: Helpful Resources

AAAS's Communicating Science: Tools for Scientists and Engineers

The American Association for the Advancement of Science's Center for Public Engagement provides resources for researchers wishing to improve communication with the greater public, offering online webinars, how-to tips for media interviews, and strategies for identifying public outreach opportunities.

http://communicatingscience.aaas.org/Pages/newmain.aspx

Center for Climate Change Communication

George Mason University's Center for Climate Change Communication provides reports, journal articles, Power-Point presentations, and other resources in order to help government agencies, non-profit organizations, and companies apply the results of their research, so that collectively, we can stabilize our planet's life sustaining climate.

http://climatechange.gmu.edu

Center for Disease Control (CDC)

The CDC has been long dedicated to protecting health and promoting quality of life through the prevention and control of disease, injury, and disability. This resource includes information on climate change and human health including: information on the health effects of climate change, partners, prevention and preparedness, publications, funding opportunities, and more.

http://www.cdc.gov/climatechange/

Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change

With contributors from diverse professional backgrounds, this book looks at communication and social change specifically targeted to climate change. It provides practical suggestions on how to communicate climate change and how to approach related social change more effectively. This volume is of interest to academic researchers and professionals in climate change, environmental policy, science communication, psychology, sociology, and geography.

Moser, S. and Dilling, L., eds. (2007). Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change, Cambridge: Cambridge University Press.

Global Warming's "Six Americas"

A national study by the Yale Project on Climate Change Communication and the George Mason University Center for Climate Change Communication identified six distinct climate change groups within the American public, ranging from "the Alarmed" to "the Dismissive." This report profiles these six different audiences and suggests ways to improve education and communication efforts to engage them.

http://www.climatechangecommunication.org/images/files/Six_Americas_June_2010(1).pdf

Health Canada

Health Canada has a very useful climate change and health communication resource titled "Communicating the Health Risks of Extreme Heat Events: Toolkit for Public Health and Emergency Management Officials." The Toolkit is based on best communication practices for addressing health risks from extreme heat events. The practices are drawn from experiences in Canadian communities and internationally. They were developed with input from public health officials and health communication experts, as well as a review of the existing literature.

www.healthcanada.gc.ca

The Intergovernmental Panel on Climate Change (IPCC)

"Climate Change 2007: Impacts, Adaptation and Vulnerability" is the second volume of the IPCC Fourth Assessment Report. After confirming in the first volume, "The Physical Science Basis" that climate change is occurring now, mostly as a result of human activities, this volume illustrates the impacts of global warming already under way and the potential for adaptation to reduce the vulnerability to, and risks of climate change. Pay particular attention to the health dimensions chapter of this report.

http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg2_report_impacts_adaptation_and_vulnerability.htm

The Lancet (Special Issues)

Working closely with the London School of Hygiene and Tropical Medicine, The Lancet Series on Energy and Health looks at access to electricity and energy poverty, transport, agriculture (including meat consumption), nuclear and renewable power, and a range of other energy issues, and the effect each has on health. It calls for action to be taken at personal, national, and global levels to address these issues.

http://www.thelancet.com/series/energy-and-health

A more recent series on Health and Climate Change is the result of an international collaboration of scientists supported by a consortium of funding bodies coordinated by the Wellcome Trust, UK. The comments and articles make a strong case for linking climate and health goals, and provide a quantitative underpinning for this important health message.

http://www.thelancet.com/series/health-and-climate-change

Making Climate Hot: Communicating the Urgency and Challenge of Global Climate Change

The article explains how to increase public understanding of, and civic engagement with, climate change, providing context for obstacles and seven strategies that applied together can increase public concern and build momentum for social and policy change.

Moser, S., Dilling, L. (2004). Making the Climate Hot: Communicating the Urgency and Challenge of Global Climate Change. Environment, Volume 26, Number 10, pp.32–46.

National Institute of Environmental Health Sciences (NIEHS)

The purpose of this NIEHS report, "A Human Health Perspective on Climate Change: A Report Outlining the Research Needs on the Human Health Effects of Climate Change," is to identify research critical for understanding the impact of climate change on human health so that we can both mitigate and adapt to the environmental effects of climate change in the healthiest and most efficient ways. This report is organized around 11 broad human health categories likely to be affected by climate change. Each category is then broken into sections that introduce the topic, explain its relationship to climate change, and identify the basic and applied research needs of that category, as well as crosscutting issues where relevant.

http://www.niehs.nih.gov/health/assets/docs_a_e/climatereport2010.pdf

Psychology and Global Climate Change: Addressing a Multi-faceted Phenomenon and Set of Challenges: A Report by the American Psychological Association's Task Force on the Interface Between Psychology and Global Climate Change

For this report, APA's task force examined decades of psychological research and practice that have been specifically applied and tested in the arena of climate change. The report offers a detailed look at the connection between psychology and global climate change and makes policy recommendations for psychological science.

http://www.apa.org/releases/climate-change.pdf

The Psychology of Climate Change Communication: A Guide for Scientists, Journalists, Educators, Political Aides, and the Interested Public

The Center for Environmental Decisions at Columbia University issued this guide, which powerfully details many of the biases and barriers to scientific communication and information processing. It offers a tool — in combination with rigorous science, innovative engineering, and effective policy design — to help societies take the pivotal actions needed to respond with urgency and accuracy to one of the greatest challenges ever faced by humanity: global-scale, human-induced environmental threats, of which the most complex and far reaching is climate change.

http://cred.columbia.edu/guide/pdfs/CREDguide_full-res.pdf

The Scientist's Guide to Talking with the Media

This book teaches researchers how to deliver an accurate message to a broader audience through the media, providing tips on how to turn abstract concepts into concrete metaphors, form sound bites, prepare for interviews, and even become a reporter's go-to scientist.

Hayes, R. & Grossman, D. (2006). The Scientist's Guide to Talking with the Media: Practical Advice from the Union of Concerned Scientists. Rutgers: Rutgers University Press.

Trust for America's Health (TFAH)

In this issue brief entitled, "Health Problems Heat Up: Climate Change and the Public's Health," TFAH examines the human health effects of climate change and the role public health authorities must play in reducing and preparing for further climate-related damage. They also explore the needs of state and local health departments as they set out to conduct climate change needs assessments and develop strategic plans to prevent and prepare for climate change. Finally, TFAH recommends increased action from federal, state, and local government to protect the nation from the harmful effects of climate change.

http://healthyamericans.org/reports/environment/TFAHClimateChangeWeb.pdf

U.S. Global Change Research Program (USGCRP)

This report, "Global Climate Change Impacts in the United States," summarizes the science of climate change and the impacts of climate change on the United States, now and in the future. It is largely based on results of the USGCRP and integrates those results with related research from around the world. This report discusses climate-related impacts for various societal and environmental sectors and regions across the nation. It is an authoritative scientific report written in plain language, with the goal of better informing public and private decision making at all levels.

http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf

World Health Organization (WHO)

WHO is the directing and coordinating authority for health within the United Nations system. It is responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries, and monitoring and assessing health trends. This resource includes key messages for communicating the human health implications of climate change, training, partnerships, publications, and links to relevant websites.

http://www.who.int/globalchange/en/
http://www.who.int/world-health-day/toolkit/report_web.pdf

References

[1] Hornik, R. (2002). Public health communication: Evidence for behavior change. Mahwah, NJ: Lawrence Erlbaum Associates.

[2] Maibach, E., Abroms, L., Marosits, M. (2007). Communication and marketing as tools to cultivate the public's health: A proposed "people and places" framework. BMC Public Health, 7, 88.

[3] Benjamin, G. (2008). Public health community announces major initiative on climate change. American Public Health Association press release. Available:

http://www.nphw.org/nphw08/08_pg_press_rel_announcmnt.htm

[4] Chan, M. (2007). The impact of global crises on health: Money, weather, and microbes. Address at the 23rd Forum on Global Issues. Available:

http://www.who.int/dg/speeches/2009/financial_crisis_20090318/en/index.html

[5] Akerlof, K., & Maibach, E. (in press). A rose by any other name…? What members of the general public prefer to call "climate change." Climate Change Letters.

[6] Schuldt, J., Konrath, S., & Schwarz, N. (2011). "Global warming" or "Climate change"? Whether the planet is warming depends on question wording. Public Opinion Quarterly, doi: 10.1093/poq/nfq073

[7] Doran, P., & Zimmerman, M. K. (2009). Examining scientific consensus on climate change. Eos, 90, 22-23.

[8] Anderegg, W..L., Prall, J. W., Harald, R., & Schneider, S. (2010). Expert credibility in climate change. PNAS, doi: 10.1073/pnas.1003187107

[9] World Health Organization. (2009). Protecting health from climate change: Connecting science, policy and people. Available:

http://whqlibdoc.who.int/publications/2009/9789241598880_eng.pdf

[10] Intergovernmental Panel on Climate Change. (2007). Climate change 2007. Impacts, adaptation, and vulnerability. Contribution of working group II to the fourth assessment report of the Intergovernmental Panel on Climate Change, M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden (Eds.). Cambridge, UK: University Press.

[11] U.S. Environmental Protection Agency. (2008). National pollutant discharge elimination system (NPDES) combined sewer overflows demographics. Available:

http://cfpub.epa.gov/npdes/cso/demo.cfm?program_id=5

[12] Costello, A., et al. (2009). Managing the health effects of climate change. Lancet, 373, 1693–1733.

[13] Trust for Americas Health. (2009). Health problems heat up: Climate change and the public's health. Available:

http://healthyamericans.org/reports/environment/TFAHClimateChangeWeb.pdf

[14] Ebi, K. L., et al. (2008). Effects of global change on human health. In J. L. Gamble (Ed.), Analyses of the effects of global change on human health and welfare and human systems. Synthesis and Assessment Product 4.6. U.S. Environmental Protection Agency, Washington, DC, pp. 39-87.

[15] U.S. Global Change Research Program. (2009). Global climate change impacts in the United States, T. R. Karl, J. M. Melillo, & T. C. Peterson, (Eds.). Cambridge, UK: University Press.

[16] National Institute of Environmental Health Sciences. (2010). A human health perspective on climate change: A report outlining the research needs on the human health effects of climate change. Available:

http://www.niehs.nih.gov/health/assets/docs_a_e/climatereport2010.pdf

[17] Luber, G. E., & Conklin, L. M. (2006). Heat-related deaths: United States, 1999–2003. Morbidity and Mortality Weekly Report, 55(29), 796-798.

[18] Gutowski, W. J. (2008). Causes of observed changes in extremes and projections of future changes. In T. R. Karl, G. A. Meehl, C. D. Miller, S. J. Hassol, A. M., Waple, & W. L. Murray (Eds.), Weather and climate extremes in a changing climate: Regions of focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands. Synthesis and Assessment Product 3.3. U.S. Climate Change Science Program, Washington, DC, pp. 81-116.

[19] Kunkel, K. E., et al. (2008). Observed changes in weather and climate extremes. In T. R. Karl, G. A. Meehl, C. D. Miller, S. J. Hassol, A. M., Waple, & W. L. Murray (Eds.), Weather and climate extremes in a changing climate: Regions of focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands. Synthesis and Assessment Product 3.3. U.S. Climate Change Science Program, Washington, DC, pp. 35-80.

[20] Grimmond, S. (2007). Urbanization and global environmental change: Local effects of urban warming. Geographical Journal, 173(1), 83-88.

[21] Anderson, C. A. (2001). Heat and violence. Current Directions in Psychological Science, 10(1), 33-38.

[22] Anderson, C. A., Bushman, B. J., & Groom, R. W. (1997). Hot years and serious and deadly assault: Empirical test of the heat hypothesis. Journal of Personality and Social Psychology, 73(6), 1213-1223.

[23] Wilbanks, T. J., et al. (2007). Industry, settlement and society. In Climate change 2007: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden (Eds.). Cambridge, UK: University Press, pp. 357-390.

[24] Wilbanks, T. J., et al. (2008).Effects of global change on human settlements. In J. L. Gamble (Ed.), Analyses of the effects of global change on human health and welfare and human systems. Synthesis and Assessment Product 4.6. U.S. Environmental Protection Agency, Washington, DC, pp. 89-109.

[25] Mead, P. S., et al. (1999). Food-related illness and death in the United States. Emerging Infectious Disease, 5(5), 607-625.

[26] World Health Organization. (2007). Global surveillance, prevention and control of chronic respiratory diseases: A comprehensive approach. Available:

http://www.who.int/gard/publications/GARD_Manual/en/index.html

[27] Environmental Defense Fund. (2008). Are we ready?: Preparing for the public health challenges of climate change. Available:

http://www.edf.org/documents/7846_AreWeReady_April2008.pdf

[28] Maibach, E. W., Chadwick, A., McBride, D., Chuk, M., Ebi, K. L., & Balbus, J. (2008). Climate change and local public health in the United States: Preparedness, programs and perceptions of local public health department directors. PLoS ONE, 3, e283.

[29] The Climate Leadership Initiative. (2009). Climate change health preparedness in Oregon: An assessment of awareness, preparation and resource needs for potential public health risks associated with climate change. Available:

http://www.theresourceinnovationgroup.org/storage/ORPHSurveyReportFinal.pdf

[30] Public Policy Institute of California. (2008). Climate change and California's local public health agencies. Available:

http://www.ppic.org/content/pubs/op/OP_208LBOP.pdf

[31] Akerlof, K., et al. (2010). Public perceptions of climate change as a human health risk: Surveys of the United States, Canada and Malta. International Journal of Environmental Research and Public Health, 7, 2559-2606.

[32] Leiserowitz, A., Maibach, E., Roser-Renouf, C,. & Smith, N. (2010). Global warming's six Americas, June 2010. Yale University and George Mason University. New Haven, CT: Yale Project on Climate Change. Available:

http://environment.yale.edu/climate/files/SixAmericasJune2010.pdf

[33] Maibach, E., Wilson, K., & Witte, J. (2010). A national survey of news directors about climate change: Preliminary findings. George Mason University. Fairfax, VA: Center for Climate Change Communication. Available:

http://www.climatechangecommunication.org/images/files/TV_News_Directors_&_Climate%20Change%281%29.PDF

[34] Pew Project for Excellence in Journalism. (2010). How news happens: A study of the news ecosystem of one American city. Available:

http://www.journalism.org/analysis_report/how_news_happens

[35] Nisbet, M. C., Price, S., Pascual-Ferra, P., & Maibach, E. (under review).Communicating the public health relevance of climate change: A news agenda building analysis. Science Communication.

[36] Ballvé, M. (June 5, 2009). U.S. ethnic media expands its reach and influence. New America Media, News Report. Available:

http://news.newamericamedia.org/news/view_article.html?article_id=bde0b14facc81d3d0b37f12aaec0e560

[37] Knight Commission for the Information Needs of Communities in a Democracy. (2009). Informing communities: Sustaining democracy in the digital age. Available:

http://westhostcomm.westhostsite.com/read-the-report-and-comment/

[38] Nisbet, M. C., Brossard, D., & Kroepsch, A. (2003). Framing science: The stem cell controversy in an age of press/politics. Harvard International Journal of Press/Politics, 8(2), 36-70.

[39] Nisbet, M. C. & Huge, M. (2006). Attention cycles and frames in the plant biotechnology debate: Managing power and participation through the press/policy connection. Harvard International Journal of Press/Politics, 11(2), 3-40.

[40] Leiserowitz, A., Maibach, E., & Roser-Renouf, C. (2009). Climate change in the American mind: Americans' climate change belief, attitudes, policy preferences, and actions. Yale University and George Mason University. New Haven, CT: Yale Project on Climate Change. Available:

http://www.climatechangecommunication.org/images/files/Climate_Change_in_the_American_Mind.pdf

[41] WESTAT. (2009). Climate change and public health: Interview findings with California legislature. Report to the Centers for Disease Control, National Center for Environmental Health.

[42] Wilkinson, P., Smith, K. R., Joffe, M., & Haines, A. (2007). A global perspective on energy: Health effects and injustices. Lancet, doi:10.1016/S0140-6736(07)61252-5

[43] Markandya, A., & Wilkinson, P. (2007). Electricity generation and health. Lancet, doi:10.1016/S0140-6736(07)61253-7

[44] Woodcock, J., Banister, D., Edwards, P., Prentice, A. M., & Roberts, I. (2007). Energy and transport. Lancet, doi:10.1016/S0140-6736(07)61254-9

[45] Wilkinson, P., Smith, K. R., Beavers, S., Tonne, C., & Oreszczyn, T. (2007). Energy, efficiency and the built environment. Lancet, doi:10.1016/S0140-6736(07)61255-0

[46] McMichael, A. J., Powles, J. W., Buttler, C. D., & Uavy, R. (2007). Food, livestock production, energy, climate change, and health. Lancet, doi:10.1016/S0140-6736(07)61256-2

[47] Haines, A., Smith, K. R., Anderson, D., Epstein, P. R., McMichael, A. J., et al. (2007). Policies for accelerating access to clean energy, improving health, advancing development, and mitigating climate change. Lancet, doi:10.1016/S0140-6736(07)61257-4

[48] Maibach, E., Roser-Renouf, C., & Leiserowitz, A. (2009). Global warming's six Americas 2009: An audience segmentation. Yale Project on Climate Change: New Haven, CT. Available:

http://environment.yale.edu/uploads/6Americas2009.pdf

[49] Maibach, E. W., Leiserowitz, A., Roser-Renouf, C., & Mertz, C. K. (2011). Identifying like-minded audiences for global warming public engagement campaigns: An audience segmentation analysis and tool development. PLoS ONE 6(3): e17571. doi:10.1371/journal.pone.0017571

[50] Gamson, W. A., Croteau, D., Hoynes, W., & Sasson, T. (1992). Media images and the social construction of reality. Annual Review of Sociology, 18, 373-393.

[51] Nisbet, M. C. (2009). Communicating climate change: Why frames matter to public engagement. Environment, 51(2), 12-23.

[52] Price, V., Nir, L., & Capella, J. N. (2005). Framing public discussion of gay civil unions. Public Opinion Quarterly, 69(2), 179-212.

[53] Scheufele, D. A. (1999). Framing as a theory of media effects. Journal of Communication 49, 103-122.

[54] Maibach, E. W., Nisbet, M. C., Baldwin, P. K., Akerlof, K., & Diao, G. (2010). Reframing climate change as a public health issue: An exploratory study of public reactions. BMC Public Health, 10, 299-309.

[55] Price, V., & Tewksbury, D. (1997). News values and public opinion: A theoretical account of media priming and framing. In G. A. Barnett & F. J. Boster (Eds.), Progress in communication science, 13, (pp. 173-212). Greenwich, CT: Ablex.

[56] Scheufele, D. A., & Tewksbury, D. (2007). Framing, agenda setting and priming: The evolution of three media effects models. Journal of Communication, 57(1), 9-20.

[57] Haines, A., et al. (2009). Public health benefits of strategies to reduce greenhouse-gas emissions: Overview and implications for policy makers. Lancet, 374(9706), 2006–2015.

[58] Maibach, E. W., Roser-Renouf, C., & Leiserowitz, A. (2008). Communication and marketing as climate change–intervention assets: A public health perspective. American Journal of Preventive Medicine, 35, 488-500.

[59] Roser-Renouf, C., & Maibach, E. (2010). Communicating climate change. In S. Priest (Ed.), Encyclopedia of Science and Technology Communication (pp. 141-147). Thousand Oaks, CA: Sage.

[60] Krosnick, J. A., Holbrook, A. L., Lowe, L., & Visser, P. S. (2006). The origins and consequences of democratic citizens' policy agendas: A study of popular concern about global warming. Climatic Change, 77, 7-43.

[61] Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. Health Education & Behavior, 27(5), 591-615.

[62] Hale, J. L., & Dillard, J. P. (1995). "Too much, too little, or just right: The role of fear in message design." In E. Maibach and R. L. Parrott (Eds). Designing health messages: Perspectives from communication theory and public health (pp.65-80). Newbury Park: Sage.

[63] Leiserowitz, A., Maibach, E., & Roser-Renouf, C. (2008). Global warming's "Six Americas": An audience segmentation. Yale Project on Climate Change: New Haven, CT. Available:

http://www.climatechangecommunication.org/images/files/SixAmericas-final-v3-Web.pdf

[64] Monahan, J. (1995). Thinking positively. Using positive affect when designing health messages. In E. Maibach & R. Parrott (Eds). Designing health messages. Thousand Oaks, CA: Sage Publications.

[65] American Lung Association. (2010). New data shows "Smart Growth" can cut 140 premature deaths and 105,000 asthma attacks and respiratory symptoms each year. Available:

http://www.lungusa.org/associations/states/california/for-the-media/new-data-shows-smart-growth.html

[66] Bloomberg, M. R., & Aggarwala, R. T. (2008). Think locally, act globally: How curbing global warming emissions can improve local public health. American Journal of Preventive Medicine, 35, 414–423.

[67] Woodcock, J., et al. (2009). Public health benefits of strategies to reduce greenhouse-gas emissions: Urban land transport. Lancet, doi:10.1016/S0140-6736(09)61714-1

[68] California Air Resources Board. (2007). Recent research findings: Health effects of particulate matter and ozone air pollution. [Online fact sheet] California Air Resources Board, [Sacramento], p. 7. Available:

http://www.arb.ca.gov/research/health/fs/pm_ozone-fs.pdf

[69] The San Diego Foundation. (2010). Key findings from recent countywide survey on climate change. Available:

http://www.sdfoundation.org/Portals/0/Newsroom/PDF/PressReleases/320_425PolicyMemoFinal.pdf

[70] Rimer, B. K. & Kreuter, M. W. (2006). Advancing tailored health communication: A persuasion and message effects perspective. Journal of Communication, 56, S184–S201.

[71] Heath, C., & Heath, D. (2007). Made to stick: Why some ideas survive and others die. New York: Random House.

[72] Health Canada. (2011). Communicating the health risks of extreme heat events: Toolkit for public health and emergency management officials. Ottawa, Ontario: Minister of Health.

[73] Dawson, B. (October 31, 1997). EPA: Warmer globe will be bad for state; Dallas conference precedes treaty negotiations in Japan. Houston Chronicle, A34.

[74] Mansur, M. (June 10, 2007). More precipitation expected as result of global warming; Midwest stands to bear the brunt of wetter weather, scientist predicts. Houston Chronicle, A18.

[75] Ackerman, T. (December 4, 1997). The threat to human health; Top physicians warn of dangers if the globe continues to warm. The Houston Chronicle.

[76] Zapotsky, M. (August 12, 2007). Nurses warm to campaign against climate change, public health practitioners see reducing carbon dioxide emissions as good preventative medicine. Washington Post, p. 6. Available:

http://www.washingtonpost.com/wp-dyn/content/article/2007/08/08/AR2007080801116.html

[77] Epstein, P. R. (October 8, 2000). West nile: It's not just local, it's global. The Washington Post, B05.

[78] Epstein, P. R. (January 28, 2004). Global chilling. The New York Times.

[79] Wilson, C. B., & Epstein, P. R. (December 14, 2010). Climate change endangers public health in the United States. Available:

http://www.huffingtonpost.com/cecil-b-wilson-md/climate-change-endangers-_b_796425.html

[80] Iyengar, S. & Kinder, D. (1987). News that matters: Television and American public opinion. Chicago: University of Chicago Press.

[81] McCombs, M. E., & Shaw, D. (1972). The agenda-setting function of the mass media. Public Opinion Quarterly, 36, 176-185.

[82] Broder, J. (2009, June 16). Government Study Warns of Climate Change Effects. The New York Times, p.13.

[83] Dlouhy, J. (June 17, 2009). Report: Climate change is here: Long-awaited paper's warnings of heat, drought, storms may sway votes in congress climate: Gulf Coast risks examined. The Houston Chronicle, A1.

[84] Suplee, C. (June 12, 2000). Drastic climate changes forecast; global warming likely to cause droughts, coastal erosion in U.S., report says. The Washington Post, A03.

[85] Fauber, J., & Vanden Brook, T. (2000). Global warming may take Great Lakes gulp; Plunge in coming century would have significant ripple effect, reports say. Milwaukee Journal Sentinel.

[86] Einsiedel, E. (2008). Public engagement and dialogue: A research review. In M. Bucchi & B. Smart (Eds.), Handbook of public communication on science and technology (pp.173-184). London: Routledge.

[87] Besley, J. C., Kramer, V. L., Yao, Q., & Toumey, C. P. (2008). Interpersonal discussion following citizen engagement on emerging technology. Science Communication, 30(4), 209-235.

[88] Irwin, A. (2008). Risk, science and public communication: Third-order thinking about scientific culture. In M. Bucchi & B. Trench (Eds.), Handbook of public communication on science and technology (pp.111-130). London: Routledge.

[89] Wynne, B. (2006). Public engagement as a means of restoring public trust in science. Community Genetics, 9(3), 211-220.

[90] Brumfiel, J. (2009). Supplanting the old media? Nature, 458, 274-277.

[91] Aufderheide, P., Clark, J., Nisbet, M. C., Dessauer, C., & Donnelly, K. (2009). Best practices in digital journalism. Report to the Corporation for Public Broadcasting by the Center for Social Media at American University, Washington, DC. Available:

http://www.centerforsocialmedia.org/sites/default/files/documents/cpb_memo_final2.pdf

[92] Nisbet, M. C., & Scheufele, D. A. (2009). What's next for science communication? Promising directions and lingering distractions. American Journal of Botany, 96 (10), 1767-1778.

[93] Dearing, J. W., Maibach, E. W, & Buller, D. B. (2006). A convergent diffusion and social marketing approach for disseminating proven approaches to physical activity promotion. American Journal of Preventive Medicine, 31, S11-23.

[94] Rogers, E. M. (2003). The diffusion of innovations (5th ed.). New York: Free Press.

[95] Lazarsfeld, P. F., Berelson, B. R., & Gaudet, H. (1948). The people's choice: How the voter makes up his mind in a presidential campaign. New York: Duell, Sloan & Pierce.

[96] Nisbet, M. C., & Kotcher, J. (2009). A two step flow of influence? Opinion-leader campaigns on climate change. Science Communication, 30, 328-358.

[97] Kelly, J. A., St. Lawrence, J. S., Stevenson, L. Y., Hauth, A. C., Kalichman, S. C., Diaz,Y. E., et al. (1992). Community AIDS/HIV risk reduction: The effects of endorsements by popular people in three cities. American Journal of Public Health, 82, 1483-1489.

[98] Shankland, S. (October 2, 2008). Obama releases iPhone recruiting, campaign tool. CNET news. Available:

http://news.cnet.com/8301-13578_3-10056519-38.html