

**Communicating the Public Health Relevance of Climate Change:
A News Agenda Building Analysis**

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ABSTRACT

In this study, we analyze two decades of U.S. newspaper coverage of climate change-related health threats, tracking the relative amount of coverage and the apparent drivers of attention at two national and four regional newspapers. 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 mentioned health threats were in reaction to naturally occurring events such as heat waves or storms; we found few examples of enterprise or explanatory reporting. However, we did find evidence that basic news agenda-building strategies, especially when localized, do generate substantive reporting. These strategies included the release of regionally tailored studies; the sponsorship of regional meetings; and news conferences on the part of a public health-related coalition. Systematic investment in these strategies—along with other recommended initiatives—is likely to increase substantive news attention to various health threats associated with climate change, and thereby increase the capacity of communities to pursue mitigation and adaptation actions.

Communicating about Climate Change and Public Health: The News Agenda-Building Challenge

Climate change poses increasingly dangerous threats to the physical health, safety, and mental well-being of Americans. These scientifically well-understood impacts include death and injury due to severe weather and climate-related disasters; heat-related illness and deaths; infectious and food-borne diseases; as well as respiratory-related problems such as allergies, asthma, and lung disease (IPCC, 2007). Segments of the American population most at risk from climate change are the poor, the very young, the elderly, those already in poor health, and those without adequate access to health care. Many of these population segments disproportionately include racial and ethnic minorities (EPA, 2009).

Responding to these climate change-related health threats will require increased awareness, coordination, resources, and training on the part of national and local-level institutions, professional groups, policy-makers, and segments of the public. To date, a major barrier to collective action has been the relatively limited news attention to these health threats. Climate change remains defined in news coverage and in the public's mind as an environmental issue, a matter of costly economic trade-offs, or a political conflict, but not as a public health problem.

Given low levels of news attention, experts and their institutions need to systematically invest in coordinated efforts at boosting the media profile for these health threats and the actions required to address them. As we review in this paper, this media relations challenge requires expert institutions — through a variety of agenda-building

strategies -- to make it easier for news organizations and journalists to effectively cover climate change as a public health problem. From a broader theoretical perspective, understanding and then intervening to shape the factors that drive news coverage is not only applicable to this case, but also to other still nascent debates involving the environment and/or public health such as those over nanotechnology, personalized medicine, peak petroleum, geoengineering, or bioenergy.

With these questions and challenges in mind, we open in this paper by reviewing past research on what scholars refer to as “news agenda-building” and the role of expert sources and institutions in this process. We then analyze several decades of news coverage of climate change at major national and regional newspapers, tracking the relative amount of attention to different types of public health impacts and the apparent drivers of coverage over time. Based on this analysis, we then identify and recommend media strategies that are likely to increase news attention to the public health dimensions of climate change, strategies that can and should be systematically pursued by government agencies, policymakers, experts, and affiliated organizations at the national and local level.

An Urgent Need for Mitigation *and* Societal Adaptation

The U.S. Federal government, states, and municipalities are now taking gradual steps towards significant mitigation policies that limit greenhouse gas emissions, policies that address the man-made causes of climate change. Yet because of the already existing build up of heat trapping pollution, the returns on these mitigation actions are not likely to occur for several decades. A focus on mitigation must therefore also come with a

focus on health-related adaptation strategies, preventative measures that prepare and protect Americans from the harmful health effects of climate change.

Consider a few examples of climate change-related public health strategies, as summarized by Frumkin et al. (2008). First, to reduce the risks from more frequent heat waves, communities will require improved architectural planning, the distribution of fans and air conditioning units; cooling centers; and resilient “smart power” grids. To address the increased incidence of food and water borne diseases, local areas will also need additional investments in watershed management and water treatment, vaccination, public education, and medical treatment. In a third example, the risks from sea level rise, hurricanes, and severe flooding will require improvements in emergency evacuation planning; sea walls and levees, and housing and urban design. As a fourth example, increased rates of respiratory problems such as lung disease, asthma, and allergies will require public education, improvements in access to air conditioning; and medical therapy.

Despite expert recognition of current (and growing) negative public health impacts associated with climate change and the need to respond with mitigation and adaptation efforts, very few local public health officials in the United States report that they have made climate change a priority (Maibach et al., 2008), and few members of the general public are aware of these public health consequences (Leiserowitz, Maibach, & Roser-Renouf, 2009). Evidence suggests that policymakers 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, were not well informed about adaptation strategies,

and did not know what as policymakers they could do about health-related risks (Westat, 2009). In all, 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. As summarized by the IPCC (2007), 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.

The News Media, Community Coordination, and Social Problems

Through several different mechanisms, news coverage enables experts, policymakers, 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. News coverage provides members of a community with information, interpretation, analysis, and debate that can bring to light solutions and trade-offs and that builds social and economic connections around action (Knight, 2009). As reviewed in this section, 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 (Pew, 2010).

Guiding public attention and evaluations. 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 (Iyengar & Kinder, 1987; McCombs & Shaw, 1972). 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, policymakers, 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. Second, research shows that the issues that receive the greatest amount of news attention are frequently used as the criteria by which the public is likely to judge, reward, or punish government officials, agencies, and corporations (Iyengar & Kinder, 1987). Policymakers and government organizations have a strong intuitive if not formal sense of how the news media can “prime” public evaluations. Therefore, if and when news attention to the health impacts of climate change increases, in order to protect their public image, key decision-makers from the across the public and private sector will become more likely to take action to address these threats. In short, news coverage promotes public accountability on the part of elected officials. As one recent report defined it: “People behave better if they are being watched” (Knight, 2009 p. 14).

Framing the relevance of the issue. Closely related to generating attention and accountability, the media also frames the definition and interpretation of these problems.

“Frames” are the conceptual term for interpretative storylines that communicate what is at stake in a societal debate and why the issue matters. Framing research as applied to the news media offers a rich explanation for how various actors, including experts, define issues in strategic ways, how journalists from various beats selectively cover these issues, and how diverse audiences differentially perceive, understand, and participate in these debates (Scheufele, 1999; Nisbet 2009). For each group, frames help simplify complex issues by lending greater weight to certain considerations and arguments over others, translating why an issue might be a problem, who or what might be responsible, and what should be done (Gamson & Modigliani, 1989). In this manner, frames provide common points of reference and meaning between experts, the media, and key audiences (Nisbet, 2009).

When the news media focuses on the health impacts of climate change, not only does this coverage bring needed attention to scientifically well-documented risks, but the coverage also shifts the public’s train of thought on climate change to a dimension of the problem that is likely to be more personally relevant and that might transcend traditional ideological divisions (Nisbet, 2009). Not every citizen cares about disastrous environmental impacts or the alleged politicization of science by conservatives and industry, yet among many scientists and advocates for policy action, these mental points of reference continue to be the dominant emphasis in communicating about climate change. In order to restart the conversation about meaningful policy action, various experts have argued that new perceptual contexts are needed, mental boxes that resonate with something that wider audiences already value or understand (Maibach, Leiserowitz, & Roser-Renouf, 2008; Moser & Dilling, 2007; Nisbet & Scheufele, 2009).

Reframing climate change as a public health problem potentially makes the complex issue more personally relevant by drawing connections to already familiar problems such as asthma, allergies, and infectious disease, while shifting the visualization of the issue away from remote arctic regions, peoples, and animals to more socially proximate neighbors and places such as suburbs and cities. In the process, the new focus is inclusive of the need for not just mitigation but also adaptation actions, while also bringing additional trusted communication partners into the fold on climate change, notably public health officials and leaders from minority and low-income communities who are the most at risk and the most vulnerable (Nisbet, 2009). Research involving in-depth interviews with representative segments of Americans finds that when climate change is introduced as a health problem with information then provided about specific mitigation-related policy actions that will lead to health benefits such as healthier air to breathe, safer food to eat, and easier neighborhoods to walk, this re-framing of the issue is compelling and positively responded to by a broad cross-section of respondents (Authors, under review). In sum, public health experts have an important perspective to share about climate change with journalists and the public, a perspective that is likely to make the problem more personally relevant, significant, and understandable, addressing mitigation and adaptation-related actions and policies that also generate many co-benefits for society.

Facilitating learning, participation, and coordination. Media coverage, especially on the part of newspapers, is also important for public participation in community and national-level decision-making. On complex issues such as climate change, studies find that newspaper coverage is the best and most readily available source

of informal learning for the public (Nisbet et al., 2002; Stamm, Emig, & Hesse, 1997). Moreover, studies conclude that the more the public learns about the technical and social dimensions of a problem, the more likely they are to directly participate with others in working towards solutions (Eveland & Scheufele, 2000; Goidel & Nisbet, 2007; McLeod, Scheufele, & Moy, 1999). Learning promotes feelings of efficacy about addressing the problem, which additionally boosts the likelihood of participation (Nisbet & Scheufele, 2004).

Newspaper coverage also typically provides readers with so-called “mobilizing information,” details about how to connect with community members and organizations, where to turn up for events and activities, and how to get involved (Hoffman, 2006; Lemert et al, 1977). As newspapers have moved their content and coverage online, the digital context has enabled more opportunities to provide mobilizing information (Hoffman, 2006). In turn, online newspaper content fuels additional attention from blogs and digital media sites (Pew, 2010), which often combine news and commentary with digital tools that enable readers to influence their friends and to contact decision-makers directly (Nisbet & Kotcher, 2009). Finally, while newspapers and online media are likely to differentially benefit higher educated audiences, to the extent that print and online newspaper coverage of a problem increases the likelihood of attention from national and local television news (Rogers, Dearing, & Chang; 1991; Trumbo, 1995; Pew, 2010), the availability of quality TV coverage can promote learning and participation from lower socio-economic segments of the public (Eveland & Scheufele, 2000).

Factors Shaping News Coverage of Climate Change as a Health Problem

If generating greater print and online newspaper coverage is a first step in triggering wider societal response to the health threats of climate change, then it is important to understand the factors that shape journalistic decision-making on the issue. “Media agenda building” is the term that media scholars use to refer to the process by which news organizations and journalists feature, emphasize, and/or select certain events or issues to cover over others (Nisbet, 2008). Similarly, “media frame building” is the process by which the events or issues that reach the news agenda are selectively defined or “framed” (Nisbet, Brossard, & Kroepsch, 2003).

Research on the agenda- and frame-building process is characterized by a diversity of theoretical and methodological approaches. However, a common thread is that news coverage is not a reflection of reality, but rather a manufactured product, determined by a hierarchy of social influences that span levels of analysis (Shoemaker & Reese, 1996; Nisbet & Huges, 2006). In this section, we describe historically how these combined factors have shaped—indeed likely constrained—overall news attention to the health dimensions of climate change.

Attention cycles and news frames. On complex issues such as climate change, experts, policymakers, and other key societal actors tend to converge on a narrow set of interpretations and these few frames of reference often come to dominate news coverage. This tendency is compounded by the “limited carrying capacity” of the news media, meaning that journalists and their organizations can only pay attention to a few problems at any given time. Consequently, unless carrying capacity increases, the rise of one narrowly defined issue into news attention means that other frames of reference on that

issue are likely to be bumped from consideration (Hilgartner & Bosk, 1988; McComas & Shanahan, 1999; Nisbet & Hoge, 2006).

Adding to this tendency, most news organizations are profit driven enterprises that are chiefly concerned with efficiently transforming complex events into appealing stories for their news consumers. Faced with financial, political, and time pressures, journalists make predictable their daily work by relying heavily on common decision-rules or “news values.” One of the chief values is proximity. For example, the more that experts can describe and point to locally relevant impacts of climate change, the more newsworthy will be the local or regional news organization (Shoemaker & Reese, 1991).

Another driver of news decisions is the attraction and need for a storyline. Visible political conflict, personality clashes, and dramatic claims over risks allow journalists to construct a “news saga” that they can cover for more than a day or week. As a result, problems such as climate-related health threats, when they remain defined in predominantly technical and scientific ways are less likely to receive wider media attention (Nisbet et al. 2003; Nisbet & Hoge, 2006). These factors are magnified by the tendency for regional news outlets to mirror closely the sets of issues and narratives emphasized by just a few national news organizations (Reese 1991) and for other community media to follow the lead of the local newspaper (Pew, 2010).

Historically, these factors have fueled what the economist Anthony Downs (1972) described as “up and down” cycles of attention to environmental issues generally and to climate change specifically. Studies show that there is always a baseline of low level attention to climate change among science journalists and other specialist correspondents, but when climate change has received its greatest media attention, it has been around

dramatic political focusing events such as the build-up to the 1997 Kyoto Treaty (McComas & Shanahan, 1999) or the controversy in 2001 over the US withdrawal from the Kyoto agreement (Boycoff, 2009). In 2006 and 2007, a confluence of politically-related events drove a historic spike in news attention including the release of the IPCC report and Al Gore's *An Inconvenient Truth* (Boycoff, 2009).

As overall news attention to an issue such as climate change increases, journalists come under increased pressure to file stories about the topic on a regular basis and to communicate to their readers' relevance, importance, and newsworthiness. Under these conditions, one way journalists are likely to dramatize the complexity of climate change through is through an increased focus on potential impacts and risks. In this case, among climate risks likely to be mentioned are those especially dramatic impacts related to public health such as linkages to increased rates of Malaria, West Nile virus, and other diseases (McComas & Shanahan, 1999; Nisbet & Huges, 2006; Nisbet, Brossard, & Kroepsch, 2003).

Information subsidies and agenda-building strategies. In order to generate coverage of a complex topic, journalists also rely heavily on their sources. Few stories are "discovered" by way of enterprise or investigative reporting. In most cases, even changes in objective indicators (e.g., economic or environmental indicators) are made newsworthy by the actions and claims of sources. In addition, journalists tend to have an authority bias which leads their reporting to narrowly reflect -- or as Bennett (1990) terms "index" -- only what are considered "official" views expressed in a policy debate. Specifically, given this authority bias, if most policymakers, advocates, and experts focus

on the environmental impacts of climate change with limited emphasis on health impacts, then routine news coverage of health impacts will be minimal.

Along with relying on an index of expert and political debate to guide news decisions, journalists also rely on so-called “information subsidies” from sources. Scientific studies (and their news releases), reports, briefings, and staged events literally “subsidize” the cost of news production, reducing the time, effort, and expertise that journalists require to cover a complicated issue such as climate change. In coverage of science, the news release about a study is the simplest form of information subsidy, though many other forms exist (Kiernan, 2006). Later in this paper we identify the types of agenda-building strategies and information subsidies that have successfully generated news attention to the public health threats of climate change.

Economic pressures and down-sizing. The economic capacity of news organizations is likely to be another major factor that influences news attention to the health impacts of climate change. The news media and newspapers are currently in a unprecedented state of economic distress, forcing dramatic cuts over the past decade in coverage of science, the environment, and health, cuts that have escalated over the past year (Brumfiel, 2009). Consider that in 1989, there were 95 U.S. newspapers that carried weekly science sections. As of 2005, there were only 35 and today there are estimated to be less than 20 (Russell 2006; 2009). This suggests the potential for diminishing coverage of climate change news in general and even more limited news about the public health relevance of climate change, especially at regional and local newspapers. We return again to this topic in the conclusion of the paper.

RESEARCH QUESTIONS

In our analysis, given the important function of the news media—especially newspapers-- in facilitating coordination and collective action on health problems, our data collection was organized around a narrow set of research questions. Specifically:

RQ1: Historically, how much newspaper attention has there been to the public health implications of climate change?

RQ1a: Across outlets, how does newspaper attention to the public health implications of climate change compare to attention to climate change generally?

RQ1b: Does newspaper attention to the public health implications of climate change differ between national and regional outlets?

RQ2: What are the identifiable patterns of newspaper attention to the public health implications of climate change across years?

RQ2a: Do these patterns of newspaper attention differ between national and local news outlets?

RQ2b: Do these patterns of newspaper attention differ by category or dimension of health related impact?

RQ3: Are there observable examples of successful news agenda-building strategies on the part of government agencies, policymakers, experts, and organizations that resulted in raising the media profile of the public health impacts of climate change? Can these same strategies be used by government agencies, policymakers, experts, and organizations going forward?

METHOD

Selection of national news outlets. As indicators of the national news agenda, we examined coverage at *The New York Times* and the *Washington Post* as archived by Lexis-Nexis. Both newspapers devote considerable resources to coverage of national politics, and both newspapers are national leaders in science, environmental, and health coverage, with a prestigious staff of journalists and editors. Moreover, the focus on these two elite national newspapers of record complements what other media analysts have observed: stories tend to spread vertically within the news hierarchy, with decision-makers at television and radio news, at regional newspapers, and various digital media often strongly deferring to these twin outlets to set the national news agenda. Given their influence, both papers are also primary targets of media lobbying and information subsidies from various expert institutions and political actors.

Our search at these outlets runs between January 1, 1985 to December 31, 2009. The start date allows for a baseline of coverage appearing before 1988, the year that James Hansen testified before Congress asserting a human role in global temperature change, a year recognized as constituting the “discovery” of climate change as a social problem (Weart, 2008).

As representative of regional newspaper coverage, we chose to examine the *Atlanta Journal Constitution*, the *Houston Chronicle*, the *Tampa Tribune*, and the *Milwaukee Journal Sentinel*. The first three outlets, in particular, are regions strongly affected by hurricanes and severe precipitation, all four outlets cover regions that have been affected by heat wave risks and deaths, and all four outlets are susceptible to

disease-related impacts. Our search in each of these newspapers dates back to 1995, the earliest year that each of the four outlets appears in Lexis Nexis.

Identifying the population of climate change-focused articles. Our first search of Lexis Nexis established the baseline for overall coverage of climate change at a specific newspaper across years. Following McComas and Shanahan (1999), we searched the headline or lead paragraph of articles by newspaper and within years using the key words “global warming” or “climate change” or “greenhouse gas” or “greenhouse effect.” With each search returned, an author reviewed the results, discarding articles that were not substantially focused on climate change, were duplicates, or were non-articles, such as content summaries for a newspaper edition. Following a previously used method for tracking coverage across news beats and sections of the newspaper, news reports, feature articles such as those at the Style page, and opinion page articles such as editorials, regular columns, and guest op-eds were included in these counts (see Nisbet et al., 2003; Nisbet & Huges, 2006). The decision-rule for inclusion, based on the key words used, was whether or not the article predominantly focused on climate change. For each newspaper, final totals for climate change focused articles were recorded by year and entered into an Excel database.

Identifying coverage that mentions public health-related impacts. To establish the subset and proportion of climate change-focused coverage across years and by newspaper that mention specific types of public health-related impacts, we first carefully read through recent reports, Web materials, and review articles published by the IPCC (2007), the World Health Organization (2007), the Centers for Disease Control (2009) and various peer-reviewed journals (Frumkin, McMichael, & Hess 2008; Frumkin et al.,

2008; Luber & Hess, 2007). Through this process, we identified 6 distinct categories of public health-related impacts and the key words most likely used to describe each form of impact in news coverage. In several cases, technical terms for specific impacts were translated into the more conventional terms that journalists were likely to use in their reporting.

We then conducted a series of trial searches that used different variations of initial key word strings. These searches were refined to maximize face validity in the articles that were returned and to remain consistent with our review of the scientific literature. Once these search strings were finalized, we then conducted the following queries across newspapers and by year. An author reviewed each of the returned results, discarding non-relevant articles. The objective was to reliably and validly identify the number of climate change-focused articles that mention in the full text of the article each type of public health-related impact.

Within the headline or lead paragraph of articles we searched “climate change” or “global warming” or “greenhouse gas” or “greenhouse effect” and then in the full text of the article we searched for mention of the following key words by each of the 6 identified public health categories with the key words listed below.

1. For reference to general public health impacts: “public health” or “health impact” or “health effect.”
2. For specific reference of heat related health impacts: “heat wave” or “heat island” or “extreme heat” or “record heat” or “severe heat.”
3. For specific reference to hurricane, severe storm, and heavy precipitation related health impacts: “hurricane” or “tropical storm” or “cyclone” or “typhoon” or

“monsoon” or “severe storm” or “storm surge” or “heavy storm” or “heavy precipitation” or “extreme precipitation” or “heavy rainfall” or “extreme rainfall.”

4. For specific lung and respiratory-related impacts: “asthma” or “lung disease” or “lung problems” or “lung infection” or “allergens” or “allergies” or “respiratory illness” or “respiratory disease” or “respiratory problem” or “respiratory infection” or “pulmonary disease” or “pulmonary illness” or “pulmonary infection” or “breathing problem” or “lung irritation” or “lung damage” or “hay fever” or “bronchitis” or “pollen” or “spores” or “ragweed” or “rhinitis” or “Legionnaires.”

5. For specific water and food borne disease-related impacts : “Water borne illness” or “water borne disease” or “water borne infection” or “food borne illness” or “food borne disease” or “food borne infection” or “contaminated food” or “food contamination” or “contaminated water” or “water contamination” or “algal bloom” or “algae bloom” or “red tide” or “e coli” or “food poisoning” or “salmonella” or “diarrhea” or “cholera” or “dysentery” or “hepatitis” or “Encephalitis” or “Giardiasis” or “ringworm” or “typhoid” or “Gastrointestinal illness” or “Gastrointestinal disease” or “myocarditis.”

6. For specific vector and rodent borne disease-related impacts: “Plague” or “typhus” or “malaria” or “yellow fever” or “dengue” or “west nile virus” or “lyme disease” or “hantavirus” or “leptospirosis” or “encephalitis” or “Meningitis” or “Rift Valley fever” or “influenza” or “parasites” or “parasitic” or “vector borne disease” or “vector borne illness” or “vector borne infection” or “rodent borne disease” or “rodent borne illness” or “rodent borne infection” or “animal borne disease” or “animal borne infection” or “animal borne illness” or “insect borne disease” or “insect borne illness” or

“insect borne infection” or “tick borne disease” or “tick borne infection” or “tick borne illness” or “insect borne disease” or “insect borne illness” or “insect borne infection.”

Identifying examples of successful agenda-building strategies. To complete our analysis, we read through the population of coverage across years at the national and local newspapers searching for articles where a) public health-related impacts were a substantive focus of coverage (rather than just being mentioned) and b) the coverage appeared to be triggered by the agenda-building strategies of a government agency, science or public health organization, expert institution such as a university, or individual expert acting on their own. These examples were recorded and then categorized into recommended news agenda-building “best practices” that can be promoted systematically at the national and local level by government agencies and various organizational sponsors.

RESULTS AND ANALYSIS

Attention at national newspapers. Between 1985 and 2009, at the *New York Times* and *Washington Post*, 6,434 climate change-focused articles appeared (see Figures 1A and 1B). However, during this 24 year period comparatively few articles mention public-health related impacts. Consider that only 3.6% (or 230) of the 6,434 articles mention general public health impacts, 6.8% (440) mention hurricane, storm, or severe precipitation related impacts; 3.7% (243) mention heat-related impacts, 1.6% (103) mention lung/respiratory impacts, 1.1% (73) mention water/ air borne disease impacts, and 3.0% (194) mention vector or rodent linked disease impacts.

[Insert Figures 1A and 1B About Here]

Over the past 5 years, as overall news attention to climate change has increased, the proportion of coverage mentioning health-related impacts has remained relatively stable. Between 2004 and 2009, as Figure 1A and 1B indicate, 3519 articles on climate change appeared at the *New York Times* and *Washington Post*, representing 55% of total coverage since 1985. Of these articles during the five years, 4.1% (or 146) mention general public health impacts, 8.3% (293) mention hurricane, storm, or severe precipitation related impacts; 2.9% (102) mention heat-related impacts, 1.1% (39) mention lung/respiratory impacts, 1.0% (35) mention water/ air borne disease impacts, and 3.2% (113) mention vector or rodent linked disease impacts.

Even in years when a specific health-related impact might experience a historic peak in news mentions, these articles are still only a very minor proportion of total climate change coverage. For example, in 2009, more stories about climate change mentioned general public health impacts (42) than any previous year but these stories still only accounted for 4.7% of total climate change-focused coverage for the year (892 total articles). In a second example, by 2007, news mentions of the possible linkages between hurricanes, severe storms, and climate change reached a historic high (293 articles), with the spike in attention likely driven by emerging studies on the topic, the prominent focus on hurricane impacts in the film *An Inconvenient Truth*, and the lingering memory of Hurricanes Katrina and Rita (see Mooney, 2007; Nisbet, 2009; for overviews). Yet these mentions in 293 articles only accounted for 9.7% of the 1097 climate change coverage-focused articles appearing that year.

Relative attention at local newspapers. As Figures 2A and 2B indicate, at the local newspapers, the proportion of climate change-focused coverage that mentions

public health-related impacts parallels the limited attention at the national outlets. The exception is mention of hurricane and severe-storm related impacts, a finding which likely reflects the relevance of hurricane impacts for three of the local papers analyzed.

[Insert Figures 2A and 2B About Here]

Between 1995 and 2009, in combined coverage at the *Atlanta Journal-Constitution*, *Houston Chronicle*, *Milwaukee Journal*, and *Tampa Tribune*, 2,285 total climate change focused articles appeared. During this 14 year period, only 3.5% (or 80 articles) mention general public health impacts, 10.7% (246) mention hurricane, storm, or severe precipitation related impacts; 4.8% (110) mention heat-related impacts, 1.5% (35) mention lung/respiratory impacts, 1.5% (24) mention water/ air borne disease impacts, and 2.2% (51) mention vector or rodent linked disease impacts.

Over the past 5 years, as overall news attention to climate change has increased at the local newspapers, the relative proportion of this coverage mentioning health-related impacts has remained consistent. The one exception, however, again is hurricane-related impacts. Between 2004 and 2009, as Figure 2A and 2B indicate, 1322 climate change focused articles have appeared at the four local newspapers, representing 58% of total coverage since 1995. Over this five year period, 4.0% (or 53) mention general public health impacts, 13.3% (176) mention hurricane, storm, or severe precipitation related impacts; 4.1% (55) mention heat-related impacts, 1.1% (14) mention lung/respiratory impacts, 1.0% (11) mention water/ air borne disease impacts, and 1.3% (18) mention vector or rodent linked disease impacts.

Patterns in attention at the national newspapers. Besides understanding the total amount of attention to public health-related impacts, we were also interested in

identifying patterns in attention across years. As Figures 1A and 1B depict, overall news attention to climate change across years has followed what researchers have described as a predictable up and down, cyclical pattern. News attention has not followed the linear growth in the scientific literature or the rise in temperatures and other observable metrics related to environmental degradation. Instead, the historic peaks in news correlate with major political moments including the build up to the 1997 Kyoto meetings, the release of the 2001 IPCC report and the George W. Bush administration's decision that year to formally withdraw the U.S. from Kyoto; the 2007 IPCC report and the continued publicity surrounding *An Inconvenient Truth*, and in 2009 the build-up to the Copenhagen meetings, the Congressional debates the same year over domestic legislation, and the EPA's decision to regulate greenhouse gas emissions.

Specific to health-related impacts, in Figure 1A, patterns of attention appear to diverge from these overall cycles. For example, instead of following major political events, articles mentioning heat-related impacts increase around real-world environmental trends and their human health impacts. These include years where incidents of record temperatures and heat-related deaths in the U.S. and Europe have occurred. Moreover, mention of hurricane and severe storm related impacts similarly correlates with major hurricane landfalls in the U.S. Also notably, attention to general public health-related impacts does not appear to follow a clear cyclical pattern. Instead, since 2002, these general mentions have been on a steady linear upward trend.

In contrast, as Figure 1B indicates, climate change focused articles that mention both types of disease-related impacts do track closely with the cyclical pattern of overall news attention. In the context of major political moments such as the 1997 Kyoto

meetings, the 2007 IPCC report or the domestic and international political events of 2009, disease-related impacts may serve as part of the dramatic fodder that sources and journalists draw upon in communicating the significance and relevance of climate change.

Mention of lung and respiratory impacts follows a slightly different pattern. While attention to this impact has historically been minimal, it increased in the years 2005-07, driven by legal battles at the national and state-level over the regulation of industry and automobile emissions. Most of this coverage, however, focused on the legal and political battle with less emphasis on the scientific context for lung and respiratory risks related to climate change.

Patterns of coverage at the local newspapers. In Figures 2A and 2B, patterns of climate change coverage at the four local newspapers tracks closely with the cyclical swings in attention at the national newspapers. Specifically, at the local newspapers, the historic peaks in overall news attention to climate change have occurred in the politically eventful years of 1997, 2001, 2007, and 2009 respectively.

Also similar to the national newspapers, the frequency of articles mentioning specific health-related impacts appears to diverge from the pattern of overall climate coverage, corresponding instead to real-world environmental or health-related indicators. Also similar to the national newspapers, mention in articles of general public health-related impacts does not appear to follow a clear cyclical pattern. Instead, these general mentions have been on a steady linear upward trend since 2005. In Figure 2B, it is more difficult to evaluate trends related to the number of articles mentioning respiratory

impacts and the two types of disease impacts, given the single digit number of these stories across combined coverage.

Examples of agenda-building strategies. In this section we highlight examples of information subsidy and agenda-building strategies that appeared to successfully trigger substantive coverage of public health impacts. This coverage occurred apart from natural events such as hurricanes or heat waves. In other words, we were interested in identifying how experts can introduce into climate change-related coverage a focus on public health threats and actions to deal with them without relying on the misfortune of disaster or tragedy.

1. *Release of scientific report or study.* 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* (Broder, 2009) 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 (Dlouhy, 2009) 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 (Suplee, 2000). The *Milwaukee Journal Sentinel* alternatively focused on the increased risk of heat waves and extreme flooding in the Midwest (Faubert & Vanden Brook, 2000).

World Health Organization sponsored studies and reports released in 2005 and 2006 also serve as useful examples. In 2005, a WHO sponsored analysis published at *Nature* led to coverage at the *Washington Post* detailing the connections between climate change and death and illness from malaria, malnutrition, and diarrhea in developing countries (Eilperin, 2005). The study was directed by University of Wisconsin-Madison scientist Jonathon Patz, with the local state angle triggering similarly focused coverage at the *Milwaukee Journal Sentinel*. The following year, a report from WHO triggered substantive coverage at the *Washington Post* focused on the links between climate change and 30 new or resurgent diseases in North America and other regions of the world (Struck, 2006).

Collaborative efforts by scientists and urban planning experts at the NASA Goddard Institute for Space Studies and several New York-area universities also serve as especially useful examples. These efforts have generated quality news coverage—and subsequent policymaker attention-- to the localized health threats of climate change. These studies also led to some of the few cases of substantive coverage of adaptation initiatives.

As early as 1997, the *New York Times* (Revkin, 1997) reported on municipal planning studies that gauged long-term climate impacts on the New York region, focusing on the potential for sea level rise and deaths from heat waves. In 2000, researchers led by Columbia University's Cynthia Rosenzweig released a New York City-specific report, generating coverage in the Metro section of the *New York Times* to the risks of heat stress, insect-borne diseases, and respiratory problems (Newman, 2000). This report was part of the previously mentioned Federal inter-agency analysis. The

focus on local health impacts then continued in Metro section stories appearing in 2001, 2002, and 2003 respectively. These news articles also featured substantive discussion of adaptation actions for the area (James, 2002; Johnson, 2003; Rather, 2001). Rosenzweig recently chaired a panel established by the Mayor's Office to study the effects of climate change on New York City. The panel's report generated *New York Times* coverage of the risks and adaptation strategies related to heat waves, power shortages, and severe coastal flooding in the area (Navarro, 2009).

2. *Regional meetings.* Evidence also 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 (Dawson, 1997). 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 (Mansur, 2007).

3. *Coalition Statements.* A limited number of news stories were also triggered by coalition building and media-lobbying efforts on the part of public health professionals. For example, in 1997, gathering at the Kyoto treaty meetings, 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 (Ackerman, 1997) 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, Public Health Practitioners See Reducing Carbon Dioxide Emissions as Good Preventative Medicine" (Zapotsky, 2007). 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.

4. *Opinion-editorials and guest columns.* Efforts at placing opinion-editorials have also led to substantive newspaper attention. The lead example derives from the efforts of Harvard University's Paul Epstein (2000; 2004) who has published guest op-eds at the *Washington Post* and *New York Times* respectively. Despite this strategy having obvious returns, in our review of coverage at the two national newspaper and four local newspapers, these are the only examples of expert authored opinion-editorials which focus primarily on the public health consequences of climate change.

CONCLUSION

As our analysis indicates, public health threats have been a dramatically under-reported dimension of the climate change story, both in national and local news coverage. Historically, for five of the public health impacts tracked, they are mentioned in less than 1 out every 20 climate change-related articles. Hurricane and severe storm impacts are a slight exception, appearing on average in roughly 1 out of every 10 climate change-related articles, though very few of these examined stories mentioned specific health

consequences such as death or injury. General mention of public health in national newspaper coverage of climate change has increased from less than 10 articles in 2003 to more than 40 articles in 2009, but these articles still only account for less than 5% of total climate change coverage.

Moreover, journalists tend to cover these impacts only when they are forced to by acts of nature or other unpredictable focusing events with few examples of enterprise or explanatory reporting. In other words, spikes in the number of stories mentioning public health threats typically follow in reaction to naturally occurring focusing events rather than a journalist backgrounding for readers the development of scientific knowledge, expert understanding, or policy proposals in the area (such as adaptation strategies). These episodic triggers include record temperatures and heat-related deaths as well as severe hurricane and storm landfalls. On the other hand, disease related impacts, when mentioned, are defined as secondary risks of climate change and are used to lend drama to coverage of a major political event such as the Kyoto or Copenhagen meetings. General mention of public health does appear to be on the rise in recent years, though these mentions still account for less than 5% of climate coverage at the leading national newspapers and the regional papers analyzed.

Instead of emphasizing health threats, journalists have instead focused their climate change coverage on environmental risks to species or ecosystems; debates over mitigation-related policy options; political conflict; and/or economic trade-offs and impacts. This convergence on just a few storylines and frames of reference on climate change reflects in part the authority bias of journalists who tend to reflect in their coverage a narrow bandwidth of “official” views expressed in a policy debate (Bennett

1990). Given that most policymakers, advocates, and experts have historically framed climate change in terms of the environment, the economy, or politics with limited emphasis on health impacts, then the “indexing” of these narrow interpretations in coverage is not surprising.

Indeed, public health experts and their institutions, until only very recently, have been relatively reserved if not reticent in their news agenda-building and media relations strategies, ceding media attention to other societal voices. Consider that our review of coverage identifies only two op-eds published by a health expert on climate change at the national newspapers examined. Yet our analysis also indicates that when experts and their institutions do pursue 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.

Systematic investment across regions and localities in these types of strategies is likely to significantly boost substantive coverage of the public health risks of climate change. These investments should also include training programs and fellowships for journalists, editors, and producers. Fellowships might involve spending time at local universities and government agencies learning about the many ways climate change is likely to impact public health in their specific coverage region. Training in media and public engagement strategies are also needed for climate and public health experts. These programs would include skills training in giving media interviews, building relationships with journalists, writing articles for the media such as op-eds, using social

media such as blogs, public speaking, coalition building, time management, and other areas. The training would include introduction to theories, concepts, and principles from science and risk communication that would be applied to the design and implementation of public and media engagement initiatives in a community (see Miller, Fahy, & ESCOnet 2009 for a model for such a program.)

Other initiatives—such as the sponsorship of local public consultation exercises and forums—may also successfully trigger news attention while having direct communication influences on lay and expert participants. Importantly, the views and information presented by citizen participants at these meetings may serve as a source of learning for experts in identifying adaptation strategies or in meeting the needs of specialized, vulnerable populations (see Besley, Kramer, Yao, & Toumey, 2008; Einsiedel, 2008; Nisbet & Scheufele, 2009 for overviews.)

In all, the findings of this paper are troubling. Absent a reliable source of news information about how climate change is impacting public health, communities lack a major part of the infrastructure and capacity needed to respond to and adapt to these risks. The continued economic distress to the news industry presents further challenges. As national and local newspapers cut back on their public affairs coverage, government agencies may need to turn to alternative models for supporting professionally gathered news about climate change, news that is tailored to the specific information needs of a region or community.

A method for augmenting reduced capacity at local newspapers is to launch government and foundation-supported digital news communities that cover issues related to climate change, energy, 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 climate change, energy, and 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 public health. 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 meetings 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 (see Aufderheide et al, 2009; Nisbet & Scheufele, 2009; Knight, 2009).

Finally, the multiple factors reviewed in this paper that influence the news agenda- and frame-building process are not unique to climate change and are generalizable to many other science, environmental, and public health issues. Similarly, the method used for analyzing, tracking, and understanding the agenda-status of climate-related public health threats in the national and local news media can and should also be applied across issues, providing a diagnostic tool for researchers and communication professionals as they design and initiate a public engagement campaign at the national or regional level. This type of formative media research—and the recommended strategies--

will be increasingly important as experts and their organizations work to meet the information needs of communities on rapidly evolving issues such as climate change, energy, and sustainability.

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Figure 1A. Mention of general health impacts; specific hurricane-related impacts, and specific heat-related impacts in combined coverage at the *New York Times* and *Washington Post*.

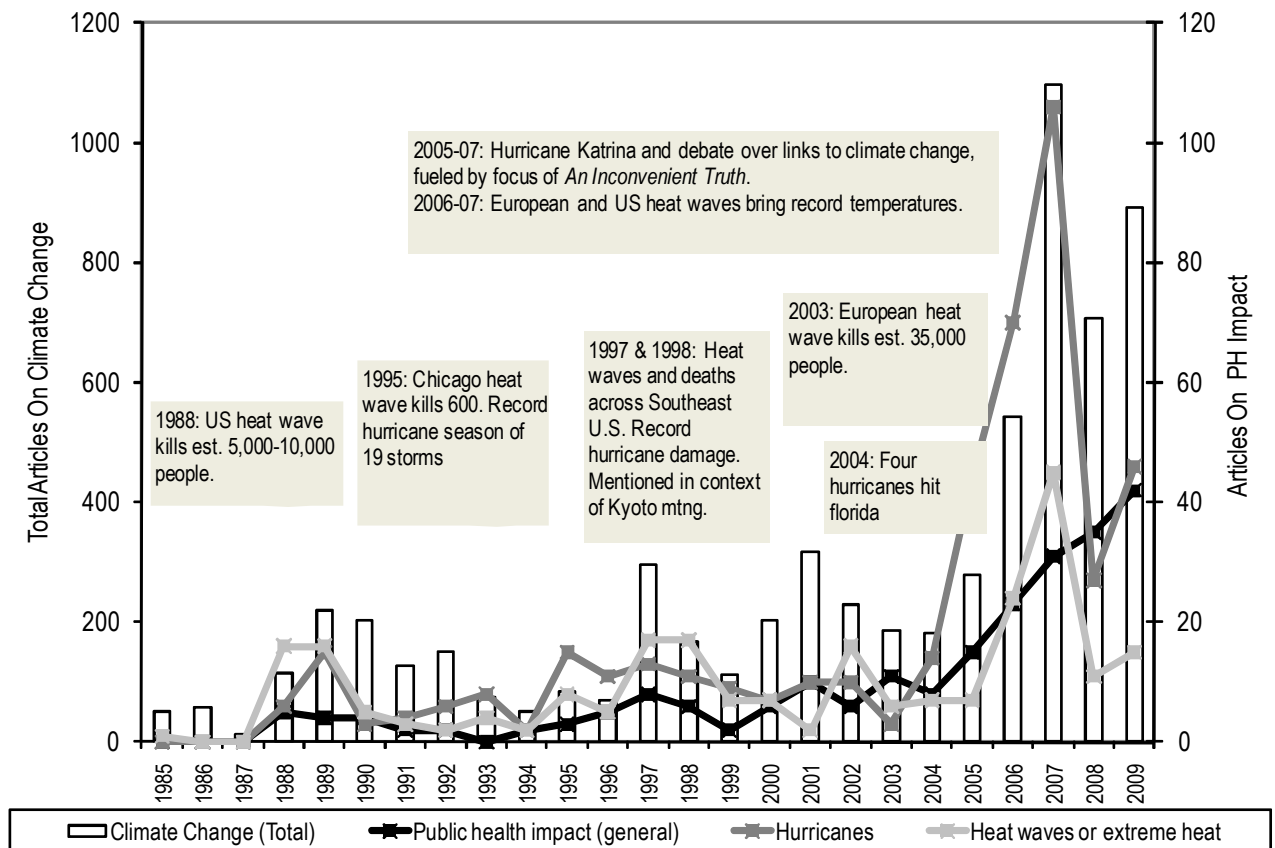


Figure 1B. Mention of climate change-related respiratory or lung-related impacts; climate change related air or waterborne disease impacts; and climate change related vector borne disease impacts in combined coverage at the *New York Times* and *Washington Post*.

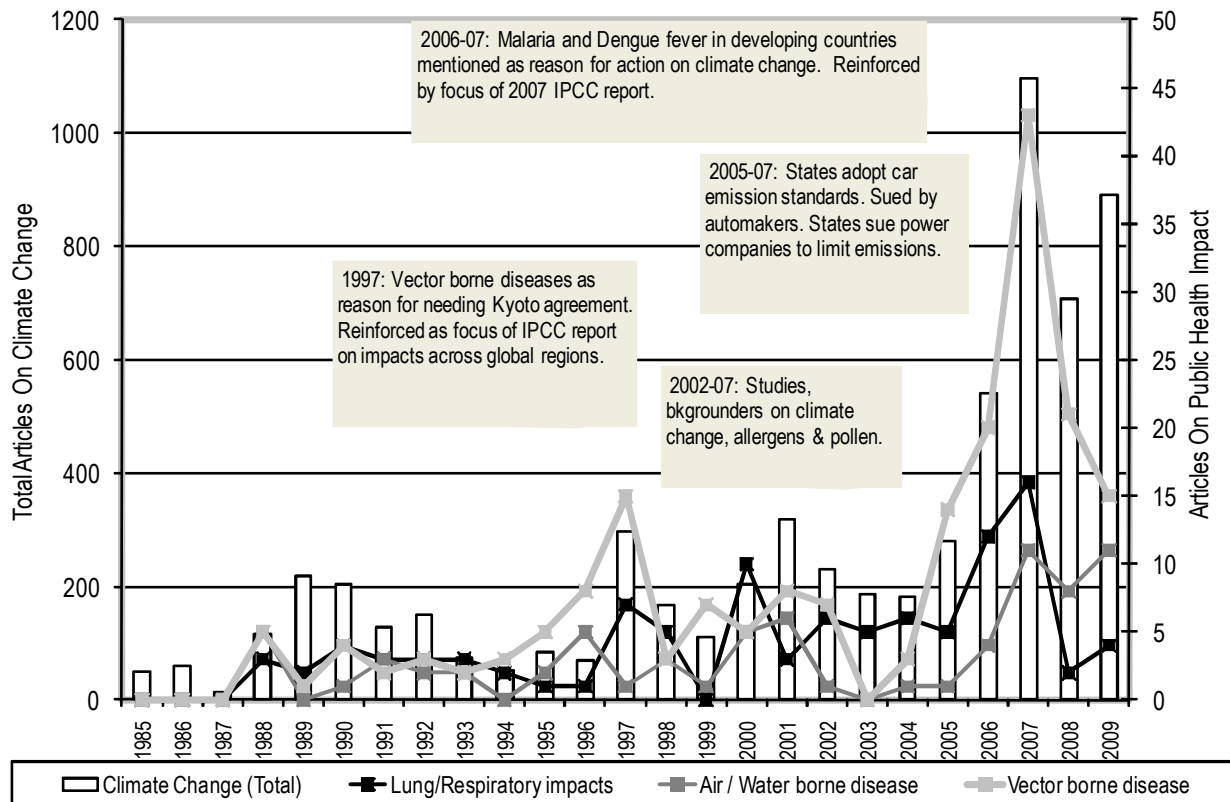


Figure 2a. Mention of general health impacts; specific hurricane-related impacts, and specific heat-related impacts in combined coverage at the *Atlanta Journal Constitution*, the *Houston Chronicle*, the *Tampa Tribune*, and the *Milwaukee Journal Sentinel*.

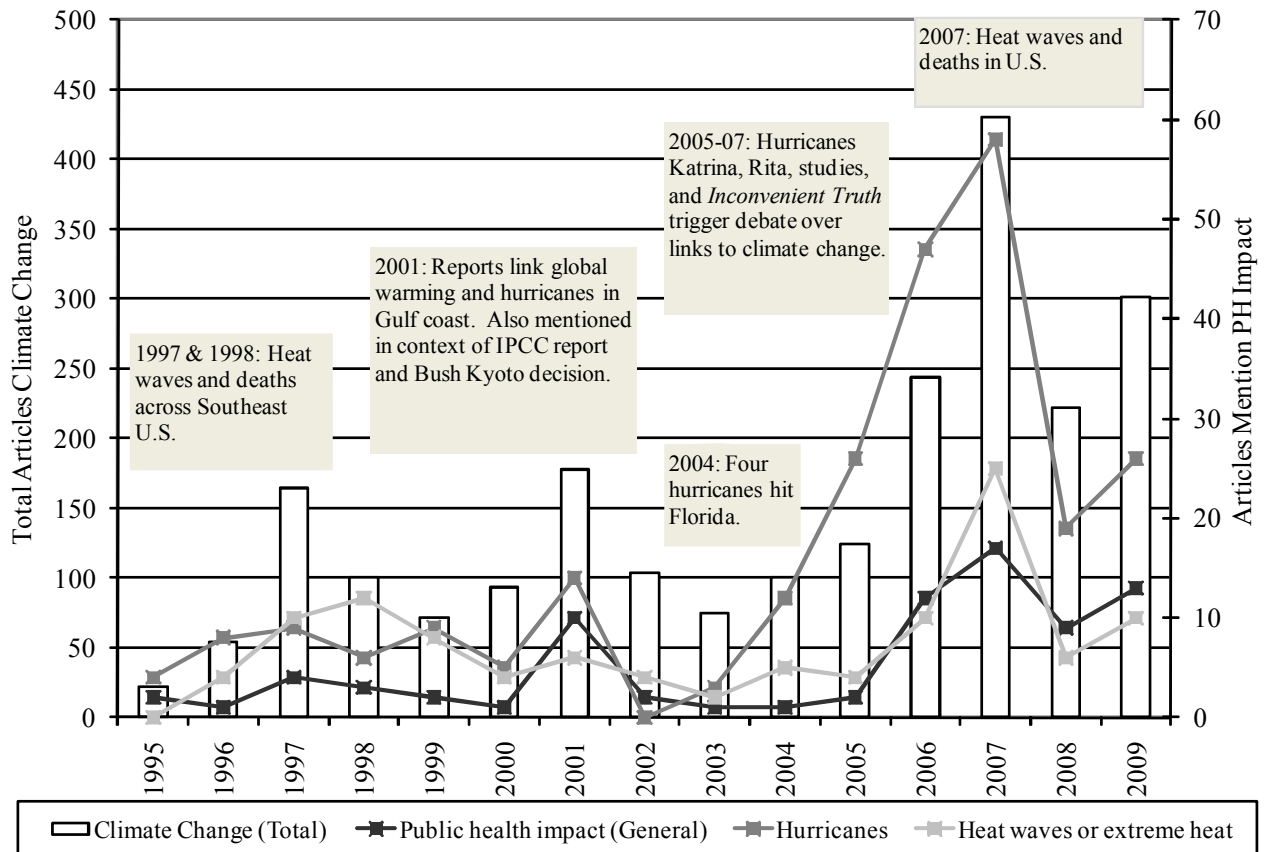


Figure 2b. Mention of respiratory or lung-related impacts; air and waterborne disease; and vector borne disease in combined coverage at the *Atlanta Journal Constitution*, the *Houston Chronicle*, the *Tampa Tribune*, and the *Milwaukee Journal Sentinel*.

