What's Real and What's News: An Exploratory Analysis of Media Coverage and Resident Perceptions of Environmental Risk Using Objective Risk Data

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ABSTRACT

Lynsy Suzanne Smithson-Stanley: What's Real and What's News: An Exploratory Analysis
of Media Coverage and Resident Perceptions of Environmental Risk Using Objective Risk
Data
(Under the direction of Dr. Dan Riffe, Dr. Robbie Cox and Dr. Jean Folkerts)

This thesis draws on five disparate data sources to examine availability and efficacy

of media covering environmental risk in North Carolina. Framed as a study of environmental

in/justice, the analysis uses objective measures of risk to examine the state's health

disparities in light of demographic data. The results indicate that counties with more poor and

more minority residents are both less healthy overall and have fewer media outlets to learn

about health and environmental risks. Recommendations for more robust and thorough media

coverage of environmental risks accompany suggestions for public health practitioners and

future research.

DEDICATION

To Matt Mulder, "Chewboy," whose loyalty proves that love is neither bound nor dictated by blood. His faith in me resonates in every part of my life, on and off the softball diamond. To my Daddy, C. Michael Stanley, the greatest scientist on earth and a champion of curiosity in all its forms — lab experiments, field trips and Finder stories. He patiently and earnestly answered every question I asked in my lifetime, and his love for learning informs everything about who I am today. To Mama, Debra Suzanne Smithson; she read to her belly from the very beginning and nurtured my love of storytelling with her own brilliant narratives. She spends every day reminding people that they are heard and that they matter. There is perhaps no greater gift than knowing how to love as she does: fiercely and unabashedly. To William "Bill" Smithson, Grandfather, who always insisted I learn the things *not* found in books. Each of our fishing trips and his awe for the hilly landscape we call home informed my decision to study environmental issues. He is the reason that I feel as at home in the woods as I do the library, and I am proud to be his granddaughter.

To each of you, your love humbles and sustains me. I am forever grateful.

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one that is as rich outside the office as within it. For all the late-night e-mails he answered,
diagrams he drew and statistical procedures he so patiently explained, this and all my work at
Carolina is a result of his ability to teach. He is a fabulous mentor and a tremendously
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CHAPTER 1

INTRODUCTION

Robert Hopewell found out about a wastewater treatment plant proposed just miles from his home in New Hill, N.C., when a bicyclist stuffed a flier into his mailbox about a meeting for concerned citizens (Bracken, 2005). That was 2005, just when the controversy about placing a regional wastewater facility in the primarily rural, unincorporated town of fewer than 1000 was heating up (Bracken, 2005). But the story goes back more than a year earlier, when the Western Wake Partnership — representing the municipalities of Apex, Cary, Holly Spring and Morrisville — reviewed potential sites for the $327 million project, which would facilitate the suburbs' continued growth and heightened levels of discharge into area rivers (Cowell, 2010). Without talking to either the residents or government leaders of New Hill, the partnership identified 180 acres in the center of New Hill as first among 28 other possibilities. The partnership justified the decision by highlighting the site's central location and ownership by a single landowner (Bracken, 2005).

Residents of New Hill, a hamlet along Old U.S. Highway 1 in southwestern Wake County, quickly protested their exclusion from the siting process and organized a community association to battle the plant. Concerns ranged from worry about offensive smells and increased traffic to the possibility of a sewage leak, which could contaminate the private wells used for drinking and irrigation (Coleman, 2007). In addition, accusations of racism

and social injustice have colored the debate: of the 230 residents immediately affected by the project, nearly 90 percent are Black, retired, on fixed income or elderly (Cowell, 2010). Historically, these kinds of problems — lack of representation in the political process, inequitable distribution of risk and benefit, have been labeled as instances of environmental injustice.

In March 2010, hundreds of community members, visitors and representatives from the Southern Coalition for Social Justice packed the pews of the First Baptist Church New Hill for a summit sponsored in part by the North Carolina Environmental Justice Network (Richardson, 2010). Aided by environmental justice advocates and social justice lawyers around the state, the community association vowed to continue its appeal. As association president Paul Barth has told *The Raleigh News & Observer*, "Until the concrete is poured, we're not going to quit" (Richardson & Cooke, 2010). However, the project took another step toward completion in January 2011, when the state Division of Water Quality granted a permit for the facility — at the New Hill location (Kenney, 2011).

That New Hill residents were kept so long in the dark regarding a decision that could threaten their quality of life as well as physical and environmental health is troubling. The questions about why the situation came to be and how it continues to evolve are numerous. One crucial issue, and the focus of this thesis, is how media fit into the picture. Why, for instance, didn't Robert Hopewell know earlier that leaders across the county were making decisions that could affect his body and home? Do residents from the partnership communities (Holly Springs, Apex, Cary and Morrisville) realize the substantial grievances New Hill residents have aired regarding the project?

Looking at conflicts like the wastewater treatment plant more broadly: Where do people get information about environmental risk? And how do media perform when covering these issues? These kinds of questions undergird the purpose of this thesis: to examine potential news sources of risk information in light of population demographics; compare coverage of environmental health risks to risk measures; and, to document and assess relationships between perceptions of environmental health risks and news coverage of them.

According to mass communication scholars such as Kensicki, "Public understanding of social issues derives from a construction provided by media over time" (2004, p. 54). Especially when those issues involve invisible threats that people cannot experience directly, including most environmental problems, media are integral information sources (Coleman, 1993). When environmental factors lead to potential health risks at the individual level, studies show media are often the *primary* information source, and that individuals turn to local media for information related to environmental issues and problems (Kahlor et al., 2006; Lacy, Riffe, & Varouhakis, 2008).

A separate area of research illustrates that demographic factors such as race and income are correlated with higher environment-related health risks: "A growing body of evidence reveals that people of color and low-income persons have borne greater environmental and health risks than the society at large in their neighborhoods, workplaces and playgrounds" (Bullard, 1994, p. 6). Such inequity persists across urban and rural areas of the United States and is often referred to as environmental racism (Ash & Fetter, 2004; Cole & Foster, 2001).

Despite decades of research done separately on the media/risk dynamic and environmental justice, the relationship between marginalized populations and access to

media-generated risk information remains largely unexplored. To attempt to link these areas of inquiry, the proposed study uses North Carolina as a case study. First, it will draw on population statistics and objective measures of health and environmental factors to illuminate relationships between race, income and relative risk. Next, it will assess the state's media landscape on a county-by-county basis and, using environmental in/justice as a lens, examine the newspaper discourse around a specific environmental health risk. Finally, it will explore how North Carolinians perceive their levels of environmental risk and how they rate news coverage of environmental issues.

This proposal opens with an admittedly brief but necessary discussion on the role of media in society with particular emphasis on media coverage of environmental issues. The literature review that follows summarizes the most relevant mass communication-related research on key conceptual areas of interest: media and environmental issues and perceptions about media performance and environmental risk. Last, the concept of environmental justice and the unique role North Carolina played in the formation of a national environmental justice movement is introduced.

CHAPTER 2

BACKGROUND AND LITERATURE REVIEW

When Harold Lasswell famously proclaimed that to "survey the environment" was
one of the three primary functions of communication, he surely wasn't referring to the air,
trees and soil that make up planet Earth (1948). That purpose (the others being transmitting
culture and creating consensus), takes on a special double meaning, however, when
considering the role of media in terms observing the *actual* environment. As Anders Hansen,
a leader in the emerging field of environmental communication, argues: "What particularly
distinguishes the history of the recent half century is the crucial role played by mass media
and communication defining 'the environment' as a concept and domain, and in bringing
environmental issues and problems to the public and political attention" (2009, p. 3).

As far back as 1921, scholars pointed out that media are particularly important in
shaping people's perceptions about what they cannot experience directly (Lippman, 1921).
Today, mass communication scholars often describe such issues as "unobtrusive" and count
environmental issues among them (Eyal, Winter & DeGeorge, 1981). Unlike obtrusive
issues, for which people can rely on interpersonal discussions and real-world experiences for
information, unobtrusive issues are rarely experienced directly. In such instances, studies
show that media are often the primary and, sometimes, the only means of information (Ader,
1995). It stands to reason, then, that when, how and with what emphases media cover

environmental issues makes a difference to the public's understanding of those issues and their importance.

The theories that support the link between mass media content and impact on perceptions, opinions and knowledge at the individual and societal levels are numerous: substantial empirical studies illustrate the likelihood that cultivation, knowledge gap and agenda-setting are all possible explanations (e.g. Carlson, 1993; McCombs & Shaw, 1972; Tichenor, Olien & Donohue, 1987). Arguing for one theory/mechanism over another is beyond the scope of this project, but suffice it to say that media coverage informs what an individual considers an environmental issue as well as what he/she believes about that issue.

When individuals use media to learn about risks connected to the environment, the role of media in shaping thoughts and beliefs becomes even more salient. In their book *Environmental Risks & The Media*, Allan, Adam and Carter (2000) go so far as to call media "central" to that process. To justify that argument, they note that often, risk-related information starts with scientific advances and discoveries; scientists, they point out, frequently frame issues of risk "in terms of probabilities which are little more than confident expressions of uncertainty" (p. 12). Thus, the explanation of risk falls on journalists, who "are charged with the responsibility of imposing meaning upon uncertainties, that is, it is expected that they will render intelligible the underlying significance of uncertainties for their audience's everyday experiences of modern life" (p. 12). Combined with the reliance on media to make sense of "unobtrusive" issues such as environmental problems, the burden of extrapolating uncertainties firmly establishes mass media as paramount in the risk information landscape.

Related studies — media, environment and risk

Sociologists, psychologists and other social scientists began parsing out the complex process of identifying and evaluating risk at the individual level in the mid-1970s. Soon after, research identified mass communication as one piece of the risk information puzzle, which also includes interpersonal dialogue and information disseminated by local governments (Salcedo, 1974). As Coleman (1993) summarized risk perception: "[it] is multidimensional and entails referential, cognitive, affective and behavioral components" (p. 614). She further describes the role and effect of mass media on that perception as an "ongoing interest of risk communication researchers" (p. 613).

As she explains, several early investigations showed media use was secondary to face-to-face communication for purposes of making risk judgments. In one study that asked participants to consider risk at the societal level, media exerted "some" influence, but that influence fell to a "negligible" level for judgments made at the personal, or self, level (Culbertson & Stempel, 1985). In a later study about AIDS, Dunwoody and Neuwirth also documented that interpersonal communication was a better predictor of risk perception than media use (1991). In her survey of New York residents about a low-level radioactive waste facility, however, Coleman found that contrary to her expectations, mass media channels *did* predict personal-level judgments about risk (as suspected, mass media also contributed significantly to the variance on judgments about societal risk). Although she described its contribution to personal risk assessments as "small," her results nonetheless support the need for analysis of exactly how and under what conditions people rely on media to explain risks (p. 620).

Research shows people turn to media for risk-related information, yet a host of conditions inform what those choices look like at the individual level. Survey results show,

for instance, that variables such as age, socioeconomic status as well as relevance and physical proximity to an environmental issue influence the medium and format of environmental-related news a person chooses to engage. Pierce, Lee-Sammons and Lovrich, for example, surveyed residents in Washington state and Japan about coverage of water quality and found that Japanese respondents rated both television importance (85 percent) and newspaper importance (83 percent) higher than survey respondents in Spokane, where TV and newspaper importance ratings were 69 and 75 percent, respectively (1988). Another study identified socioeconomic status as an independent variable and documented that low-income residents ascribed greater credibility to broadcast media, whereas residents with a higher socioeconomic statues relied more on print (Williams et al., 2000).

What's more, concepts such as sufficiency of information — "an individual's assessment of the information he or she needs to cope adequately with a specific risk" — have shown to be accurate predictors of information-seeking behaviors (Griffin et al., 2004, p. 24). In a RDD survey of 482 adults in a midwestern state, Riffe and Hrach confirmed a significant, positive correlation between perceived information sufficiency and attention to local television and newspaper stories about environmental issues (2009). Beyond attention to news, however, the question of how well media cover these issues is an important one. When Riffe and Hrach asked respondents to assess the quality of TV and newspaper stories about environmental issues, for example, they found that respondents who rated themselves more at risk were both more attentive *and* more critical of coverage. Regular environmental news viewers, they hypothesized, might be more critical of environmental coverage because they are more knowledgeable about those issues (2009, p. 15).

Evaluating coverage of environmental problems specifically, one survey of Ohio residents documented, in general, that respondents gave both TV and newspapers high marks (Riffe, Lacy & Reimold, 2007). Although answers about performance regarding specific dimensions of coverage — costs and solutions — revealed higher scores for newspapers than TV, fewer than half of respondents rated either TV or newspaper performances as "very good" or "somewhat good" at covering those factors (p. 82). A nationwide study that used telephone surveys to assemble a "report card" of audience evaluations regarding newspaper coverage of environmental problems along those same dimensions — costs, solutions, causes, victims and who is responsible — indicated newspapers earned high marks for covering the causes and victims of environmental problems but failed to illuminate the other three dimensions (Riffe & Reimold, 2008). This finding is consistent with earlier conclusions about the frequent lack of substantive explanation and context in coverage of environmental problems (Liebler & Bendix, 1996).

Looking at the effect of media exposure on perceptions of environmental risk, a survey of residents in environmentally distressed counties in Appalachia showed that reading medical research news was highly correlated with respondents' reporting higher numbers of serious local health hazards (Riffe, 2006a). The author avoided making assertions about directionality (e.g. whether the environmental situation itself leads to more information-seeking behavior), but a later study confirmed that respondents who more often read stories about the environment rated themselves as being not only significantly more knowledgeable than those who didn't but also at higher risk for environment-related problems (Riffe, 2006b).

That is not to say, of course, that public reliance on the media translates into coverage that accurately reflects the scientific realities of environmental risk. Studies show that mass media often over-report risks generated by dramatic events, such as chemical plant accidents or natural disasters like hurricanes, and do not provide sustained coverage of long-term, scientifically documented threats (Allan, Adam & Carter, 2000). Greenberg et al.'s analysis of network TV coverage of environmental risks, for instance, revealed airplane accidents received seven times more coverage than smoking/tobacco use and 29 times more coverage than asbestos, risks at the time 1,590 and 41 times more likely to kill Americans, respectively (1989, p. 272). Such disproportionate coverage, the authors argue, "reinforces the public's well-documented tendency to overestimate sudden and violent risks and underestimate chronic ones" (p. 276).

This kind of conflated coverage of catastrophe over constant but unseen environmental impacts creates a meaningful chasm in the understanding of environmental problems because rather than presenting them as the outcome of bureaucratic calculations and decisions, media portray environmental problems as one-time, event-specific incidences (Allan, Adam & Carter, p. 8). "This journalistic bias in favor of the new and the current," Singer and Endreny argue, may limit coverage of chronic hazards such as illness, air or water pollution, poverty, and hazardous working conditions, unless some dramatic happening makes them suddenly, 'news' " (1994, p. 262).

The effect of such imbalance might also be to limit the inclusion of non-technical elements of risk in coverage. In her study of newspaper coverage of a mine proposed near an American-Indian community in Wisconsin, for example, Coleman suggested that attention to one-time events meant the news discourse overlooked important cultural considerations of

the would-be victims: "Rather than providing in-depth analysis of issues such as tribal rights or the controversial history of the mining company's operations in other communities, the newspaper covered events, such as court hearings" (1995, p. 76).

Research also shows that when covering a specific type of health risk, media underplay the significance of environmental factors. In a study of newspaper, magazine and TV news stories about breast cancer, data revealed that a mere 1 percent of stories mentioned exposure to environmental contaminants as a possible cause of the disease (Atkin et al., 2008). Their study looked specifically at information that could "educate and persuade the readers and viewers," and, consistent with prior investigations of environmental risk coverage, found that mass media fail to provide the kind of "mobilizing information" that empowers a viewer/reader to take action to prevent or lessen his/her vulnerability to a certain risk (Atkin et al., 2008, p. 4; Lemert, 1984, p. 259; Liebler & Bendix, 1996).

Therefore, as established as public reliance on media for risk information is, that performance is far from perfect. Any shortcomings in the journalistic sense are then compounded by individual-level variables that can affect how a person processes that news. Without question, there is a great need to more fully explore this interaction.

Historical and conceptual foundations of environmental justice

Environmental justice, or "calls to recognize and halt the disproportionate burdens imposed on poor and minority communities by environmentally harmful conditions," gained national recognition with protests against hazardous waste facilities in low-income and minority communities in the early 1980s (Cox, 2010, p. 264). One of the most publicized protests took place in 1982 in Warren County, N.C., where the state dumped soil laden with PCB (polychlorinated biphenyl, a probable carcinogen known to contribute to liver disease

and reproductive problems) in a township where 69 percent of residents were minorities and 20 percent had incomes below the federal poverty level (North Carolina Department of Natural Resources, 2009).

Like protesters in Warren County — 500 of whom were arrested — early environmental justice advocates saw such siting decisions as racially motivated, in part because their communities were viewed as politically powerless (Bullard, 1994). To challenge such systematic inequity, they borrowed political activism tactics, namely sit-ins and nonviolent protests, from the Civil Rights movement (Pezzullo & Sandler, 2007). As Cox and other environmental communication scholars explain, environmental justice and the grassroots, community-based movement of the same name provided a link between the seemingly disparate discourses of the Civil Rights and environmental movements (Cox, 2010). Whereas mainstream environmental groups had told urban activists fighting waste facilities that their concerns weren't adequately "environmental," the environmental justice movement provided a new language with which to describe and, eventually, work toward ending such disparate exposure (Di Chiro, 1998, p. 299).

Bullard describes the mobilization against racially disparate siting of waste facilities as "a new form of environmental activism" that led to a concerted effort to document the relationship between the location of hazardous waste landfills and race (1994, p. 5). Two separate reports — the U.S. General Accounting Office report in 1983 and "Toxic Wastes and Race in the United States," published by the United Church of Christ Commission for Racial Justice in 1987 — offered evidence that "African Americans were clearly overrepresented in communities with waste sites" (Bullard, 1994, p. 6). Inequities in the legal realm were also recognized: "There is a racial divide in the way the U.S. government cleans

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up toxic waste sites and punishes polluters. White communities see faster action, better results and stiffer penalties than communities where Blacks, Hispanics and other minorities live" (Lavelle & Coyle, 1992, S1-2).

The decades since Warren County have produced a number of grassroots environmental justice groups, many of whom successfully protected their neighborhoods and communities from industrial waste sites. And at the national level, environmental justice advocates celebrated an important milestone in 1994 when President Clinton signed Executive Order 12898, which mandated the federal government make achieving environmental justice part of its mission "by identifying and addressing … disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations in the United States" (Clinton, 1994, p. 7629).

Yet as work in sociology, geography, public health and economics illustrates, inequalities persist. When Evans and Kantrowitz (2002) broadly constructed "environmental conditions" to include variables as diverse as hazardous wastes, ambient and indoor air pollutants, water quality, educational facilities, work environments and neighborhood connections, for example, they concluded that "there is clearly consistent evidence that people who are poorer in the United States are more likely to be exposed to multiple, environmental risks that portend to adverse health consequences" (p. 325). Additionally, economists using Census blocks and the Environmental Protection Agency's Risk-Screening Environmental Indicators Model found: "[I]n the urban United States as a whole, block groups with more African-Americans have higher levels of toxic pollution … when we

control for differences between cities … Hispanics, as well as African Americans, tend to live in more polluted neighborhoods" (Ash & Fetter, 2004, p. 459).

Further complicating the issues, however, is a tension among scholars and activists known as the "class versus race debate" (Brulle & Pellow, 2006, p. 106). As Brulle and Pellow explain, "Although the vast majority of studies of environmental inequality conclude that racism is the major driving factor, there has been considerable debate in some corners about the degree to which this phenomenon is a function of racial inequalities or class-based market dynamics" (2006, p. 106). This disagreement — whether class or race or a mixture of both contributes most to environmental inequalities — only serves to illustrate the inherent methodological challenge of measuring environmental in/justice. Evans and Kantrowitz, for example, argue for data on environmental exposures that run across a continuum of income rather than divided along above and below the poverty line. Researchers in public policy, on the other hand, insist, "many situations of environmental justice are compositions of more than one problem. Thus, given a multi-dimensional problem, a multi-dimensional analysis approach may be required" (Rhodes, 2003, p. 94). Specific measurement suggestions continue to diverge, with some scholars urging an end to the "controversy over appropriate spatial scale analysis" and others linking environmental justice measurement to public policy outcomes (Abel, 2003; Noonan, 2008).

In addition to these methodological challenges, academics have yet to come up with a consistent conceptual definition for environmental justice. Bullard, for instance, emphasizes the disparities between urban and suburban environmental conditions, and his work argues that while risks of environmentally harmful plants and landfills are localized to minority communities, the benefits are spread across all segments of society (1994). Authors Cole and

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Foster, on the other hand, construe environmental justice not only as rectifying place-based problems but also as including "democratic decision making, community empowerment and the incorporation of a social structure — for example, existing community health problems, cumulative impacts of preexisting environmental hazards, the effect of segregative housing patterns — in environmental decision-making processes" (2001, p. 16).

Scholars from fields such as sociology add yet another layer to the conceptual puzzle. Taylor, for instance, asserts that self-determination — "the struggle to define who they [people of color] are and how they interact with the land" — lies at the heart of environmental justice (2000, p. 534). To that end, she describes the environmental justice movement as providing a "master frame" that draws on potent symbols of the Civil Rights movement and links ecological concerns with those of labor and social justice. Whereas the traditional American environmental movement was dominated and defined according to values of middle-class white men, environmental justice and its surrounding discourse, she argues, "transformed the way mainstream environmentalists think about the environment [and] changed the perception in many communities of color that people need not concern themselves with environmental issues" (p. 523).

Engaging in the debate about the salient cause or preferred way to measure environmental injustice is not as important to the current research, however, as recognizing the distinct type of environmental threat environmental injustice poses. That is, minorities and low-income Americans shoulder a heavier burden of environmental risk through a number of avenues — toxic-producing and stress-inducing neighborhood industrial waste facilities being the most publicized — but with myriad other issues now included within the environmental justice discourse (Brulle & Pellow, 2006).

Additionally, it is important to recognize the unique role North Carolina played in the formation of a national environmental justice movement. Some of the individuals who lay on the ground when trucks of PCB-laden soil rolled into Warren County that summer have made fighting such systematic inequity their life's work. Almost 30 years after those events captivated the nation and catapulted the concept of "environmental justice" onto the national scene, minority and low-income North Carolinians continue to protest against landfills, hog farms and incinerators proposed for their communities. In fact, the North Carolina Environmental Justice Network has enough issues to keep it busy year-round, with summits, protests and legislative actions ongoing throughout the state.

Furthermore, despite consistent evidence of ongoing environmental injustice at the national and state levels and studies that show media ignore risks affecting blacks and the poor, precise information about access to and substance of environmental risk information generated by the media is not available (Singer & Endreny, 1994).

Related studies — environmental justice in the media

Researchers contend that, consistent with the case of Warren County, "A major forum in which environmental justice issues are articulated is the mass media, especially newspapers" (Burch & Harry, 2004, p. 559). It is not surprising, then, that the few mass communication studies to examine coverage of environmental justice have assessed newspaper coverage.

Burch and Harry completed one of the only quantitative studies with their content analysis of four California newspapers' coverage of pesticide use and the farm workers who face health risks due to the dangerous chemicals (2004). Their data showed sources from only three categories — government, industry and activists — dominated the coverage.

Counter to their hypothesis, they discovered sources favoring an anti-pesticide position were more prevalent than those for pesticide use.

More often, studies about environmental justice news come from a cultural/critical perspective and use qualitative methods. Cantzler, for example, used discourse analysis to illuminate rhetorical themes of autonomy, self-determination and human rights in newspaper coverage of a whaling battle involving the Makah Tribe along the coast of Washington state (2007). Whereas mainstream environmentalists chastised the tribe for the practice, environmental justice advocates tied the hunting to the tribe's understanding of itself and its history. Echoing Hansen's assessment of media's crucial role in explaining what constitutes the environment and an environmental issue, she identified newspaper content as the forum in which contested meanings about the natural and social worlds are constructed and pro- and anti-whaling groups goals articulated.

Marchi assessed journalistic framing in newspaper coverage of a controversial runway at Boston's Logan Airport and near a working-class neighborhood (2005). She found that early on in the discussion process, articles from both newspapers echoed the rhetoric of "elite sources" such as the airline, business and hospitality industries, who framed the project as essential to the economic health of the region (2005, p. 474). Over the course of the debate, however, community organizers were able to reframe newspaper coverage to include recognition of equity-related issues such as noise pollution, health risks and environmental impacts.

As this brief literature review illustrates, the role of media within a greater context of structural health- and environment-related inequalities remains under-researched. Within the

context of North Carolina, this study aims to examine relationship between media access, media coverage and environmental risk by addressing the following research questions:

RQ1: What is the relationship between objective risk assessments and population demographics in North Carolina counties?

RQ2: What is the potential news and information diet serving counties with higher and lower risk assessments?

RQ3: What is the relationship between risk measurements and media coverage of risk?

RQ4: What is the relationship between residents' risk perceptions, objective risk measurements and residents' reported use of media?

RQ5: What is the relationship between perceived efficacy of media coverage of environmental health issues and coverage itself?

CHAPTER 3

METHODS

The proposed study drew on five disparate data sources to answer the research

questions: objective measurements of health and environmental quality in each of North

Carolina's 100 counties; Census data on county demographics, such as minority populations

and average income; data on the news media serving each county, including minority outlets;

and a content analysis of newspaper coverage of air pollution. Last, the study integrated

statewide RDD survey data, aggregated at the county level, to attempt to provide some

indication of residents' own perceptions about environmental health threats and media

coverage of environmental issues. Each of these data sources is briefly described below.

Objective risk-related data used in this study

To assess how well media "survey the environment" in the literal sense, it is helpful

to have an objective set of measures against which to compare media performance. There are

endless reports and data sources that could offer "real" observations about the health of both

people and the environment in North Carolina. Given the goals of this study, however, the

most relevant and accessible is the Robert Wood Johnson Foundation (RWJF) and the

University of Wisconsin's Population Health Institute's "County Health Rankings:

Mobilizing Action Toward Community Health," which ranked counties in all 50 states based

on a variety of health- and environment-related factors.

In addition to working closely with health departments at the county level, the report

gathered data from a number of national data sources, including the Behavioral Risk Factor

Surveillance System, National Center for Health Statistics, National Center for Hepatitis,

HIV, STD and TB Prevention and more.[1] Described as an opportunity for residents to get a

"snapshot" of their county's health, the report acknowledges, "there are big differences in

health across communities … and up to now, it has been hard to get a standard way to

measure how healthy a county is and see where they can improve" (p. 1).

The process for choosing measures was guided by a review of literature, expert

opinion and data analysis. The resulting model is based on two main concepts: health

outcomes, which reflect morbidity and mortality statistics; and health factors, a composite

measure reflecting multiple indicators: physical environment, social/economic factors,

clinical care and health behavior scores. Each indicator represents various sub-indicators:

physical environment (environmental quality and built environment); social/economic factors

(education, employment, income, family and social support, community safety); clinical care

(access to care and quality of care); and health behaviors (tobacco use, diet and exercise,

alcohol use and unsafe sex).

Ranks were assigned by the Robert Wood Johnston Foundation to North Carolina

counties according to scores on each of the two main measures (e.g., a county ranking "1" in

health outcomes would have the lowest morbidity and mortality rates) as well each

contributing indicator (See Appendix B for the entire report). As the report authors explain,

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[1] Additional national databases used include: National Center for Chronic Disease Prevention and Health
Promotion, CDC Environmental Protection Agency Collaboration, Health Resources and Services
Administration (Area Resource File), Decennial Census and American Community Survey (for population and
zip code business patterns at the county level), Small Area Health Insurance Estimates, Small Area Income and
Poverty Estimates, Federal Bureau of Investigation, Dartmouth Atlas Project and the National Center for
Education Statistics.

some of the measures are more reliable than others due to methods used during data collection (e.g. deaths are reported 100 percent of the time, whereas air quality and binge drinking statistics require sampling). Yet the authors point out: "[W]hen all of the measures are combined, we are confident that these measures provide a solid picture of the overall health in a community" (2009, p. 3).[2]

Despite the wealth of data the report provides, it was not designed to examine the relationship between county health and population demographics such as race — a factor consistently identified as correlating to health and environmental disparities. To some extent, this gap provided the impetus for much of this project. That is: to examine risk measurements in light of who lives in a given county and to complete an exploratory assessment of how media access and coverage might vary from county to county.

Supplementing objective measures of risk

Thus, county-level population data were used to complement the RWJF report, in order to test for relationships between population demographics and objective measures of relative health and environmental risk. Specifically, for each of the state's 100 counties, U.S. Census Bureau "QuickFact" reports and "FactFinder" data sheets provided these additional variables: population nonwhite (count and percentage of total population), per capita income and percent of county population living below the federal poverty level.[3] Information for the

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[2] Regarding methods, the report states: "Within each of our county snapshots, we provide the margin of errors or 95 percent confidence intervals for the data that comprises our indicators" (2009, p. 3). For counties where the sample size was not large enough to derive an individual measure, the overall rank of the county did not include that measure.

[3] All data for this variable was dated 2008.

rural/urban classification came from the North Carolina Rural Economic Development Center.[4]

The environmental justice literature shows that more than any other variables, race and income are most significantly correlated with *who* and *what kinds of communities* face environmental injustice (Cole & Foster, 2001). And although environmental injustice exists in both urban and rural areas, the kinds of problems associated with each geographic area are distinct. Rural North Carolina counties do not have as many industrial zones that contribute to air pollution levels, for example, but industrial-scale hog farming is a persistent problem.

Assessing potential media diet

As theories such as social learning and cultivation suggest, media "can serve the function necessary to affect cognitive behavior — the information, motivative and reinforcing function" (Cozma, 2006, p. 9). Thus, an indication of *what kinds* and *how many* media serve a county is an important piece of this study. Thus, a measure of *potential media diet* was created. Several variables, each representing a different kind of media outlet, comprise this construct. The following were considered and counted separately: daily general-audience newspapers, weekly (with semi-weekly) general-audience newspapers, TV stations, radio stations, African-American and Spanish-language newspapers. Due to the difficulties of tracking broadcast reception across county lines, only the physical location of TV and radio stations was counted — not all the counties a signal reaches. Additionally, a total print sources variable indicated the combined number of daily, weekly, African-American and Spanish-language newspapers in each county. Given the demonstrated

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[4] According to the North Carolina Rural Economic Development Center, the 85 counties designated as rural had a population density of "no more than 250 people per square mile" in the 2000 Census. This definition of rural, they note, has been adopted in the legislation of the N.C. General Assembly.

importance of print sources in disseminating environmental health information, this variable gauged how many total print outlets a county possessed.

The *Gale Directory of Publications and Broadcast Media* (146th ed., 2010), a national online database assessable through the UNC-CH library, was the primary source for counting these outlets. To assess the validity of the *Gale Directory*'s data, a sample of each media type was cross-checked against other databases/lists: *Ulrich's Periodicals Directory* (for print sources),[5] North Carolina Association of Broadcasters (for TV and radio sources), Latijam (for Spanish-language newspapers) and catalogues at the University of North Carolina at Chapel Hill libraries (for African-American newspapers).

With the exception of African-American and Spanish-language newspapers, the *Gale Directory* was more exhaustive than the databases compared against it. Compiling a complete list of current African-American newspapers around the state required a combination library-specific and general Web searches.[6] Because Latijam[7] is specifically devoted to tracking Latino media sources throughout the Southeast, its "Media Directory" was more comprehensive than any other available list.

Tracking air pollution discourse in media coverage

The study also includes a content analysis of newspaper coverage of one selected environmental problem, employing a database search of two years' editions of eight major

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[5] Although *Editor & Publisher*'s "Market Guide" has been the standard reference for projects of this type, the report is not longer available free online. Thus, *Ulrich's*, which is available free and online for all University of North Carolina at Chapel Hill students, was instead.

[6] When the researcher had thoroughly searched both the University of North Carolina's library database for "African American Newspapers" and general Internet searches, she verified — over the telephone — the exhaustiveness of the list with a member of the North Carolina Association of Black Publishers.

[7] Latijam, or Latino Journalism and Media at Carolina, is "a school-wide project of the School of Journalism and Mass Communication at the University of North Carolina at Chapel Hill … [and] is dedicated to promote and practice fair and competent reporting about Latino life in North Carolina" ("Latijam, 2011").

NC newspapers. Content analysis is "the systematic assignment of communication content to categories according to rules, and the analysis of relationships involving those categories using statistical methods" (Riffe, Lacy & Fico, 2005, p. 25). Unlike more critical or qualitative methods, content analyses are designed to describe and draw inferences from manifest content, or the "denotative meanings that most people share and apply to given symbols" (Riffe, Lacy & Fico, p. 37). For this study, content analysis helps illuminate what facts and what context surrounds news portrayals of air pollution.

The broad area of scholarly and activist interests that fall within the EJ movement address issues ranging from lowering instances of lead poisoning to building urban playgrounds and fighting industrial dumping into waterways. Ideally, this study would explore many or all of those that take place within North Carolina. Given the complexity of the study's design and planned analysis, however, such a massive content analysis is not practical. As such, it was necessary to identify a single environmental health threat: air pollution.

The decision to identify air pollution as the environmental risk of choice for this project was not arbitrary but matches the goals of this study. First, air pollution is an environmental problem created by or associated with many of issues connected to environmental injustice: proximity to industrial waste sites, toxic exposure, pesticide use and more. Second, it is a problem that affects urban and rural residents, though its sources may vary (e.g., auto emissions in urban areas vs. pesticide use in rural agricultural areas). Third, air pollution is part of the RWJF's assessment of "air quality," one of the factors included in the physical environment rank. As such, it provided both a searchable term among news

coverage and an opportunity for cross-data analysis of actual measures of environmental health/risk.

Because research shows that newspapers are the primary source of information for local environmental issues, only stories about air pollution in general-audience, daily newspapers were assessed (Johnson-Cartee, Graham & Foster, 1992; Harry & Burch, 2005). The population for this sample was stories in the state's largest eight newspapers (a figure derived from matching North Carolina's Audit Bureau of Circulations[8] report with searchable papers in America's Newspapers database) that include the phrase "air pollution" anywhere in the text. The timeframe for the search was from Jan. 1, 2009 to Dec. 31, 2010, a period that overlaps both with the RWJF report and the collection of survey data described below. A preliminary search confirmed that using only the top eight papers did not exclude a significant amount of the state's newspaper discourse on air pollution. The top eight papers produced 305 articles, or 87 percent of all "air pollution" stories in all 20 searchable daily newspapers in North Carolina during the relevant dates. These articles were checked for relevance, and obituaries and articles about air pollution outside the United States were excluded.

To assess the quantity and penetration of air pollution stories in a given county, three separate variables were measured. First, "top 8 newspapers" reflects the total number of top 8 newspapers distributed in the county. Brunswick County, for example, receives *The Charlotte Observer*, *The Raleigh News & Observer* and *The Wilmington Star News*, so it received a 3 for "top 8 newspapers" variable.

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[8] The Audit Bureau of Circulations (ABC) provides "independent, third-party circulation audits of print circulation, readership and website activity. As a tripartite association, ABC is funded by dues and service fees paid by the three groups it serves: advertisers, advertising agencies, and publishers" ("About ABC," 2011). Because many ABC reports are proprietary, the librarian at the Park Library (who has an ABC membership) assisted the researcher with data collection during this phase.

To gauge the potential reach of the top 8 papers distributed in each county, a "total penetration of top 8" variable was recorded. This required adding together the penetration figures (defined here as households in the county receiving the paper divided by total county households) for each of the top 8 papers distributed in the county. Circulation and penetration data came from each paper's most recent 2009 ABC report.[9] Brunswick County, for example, has 46,078 total households. *The Charlotte Observer* reaches 387 of those households, so the penetration for that paper in Brunswick County is 0.8 percent. *The Raleigh News & Observer* reaches 0.6 (270) of all households, and *The Wilmington Star News* reaches 19.3 percent (8,881) of all households. So Brunswick county's "total penetration of top 8" was 20.7 (0.8 + 0.6 + 19.3).

Next, a county-level variable for "total air pollution stories" was created. This variable reflects the sum of air pollution articles from each of the top 8 newspapers circulated in that county. For example, some residents in Alamance County receive *The Raleigh News & Observer*, *Greensboro News & Record* and the *Durham Herald-Sun*. Because the search query and relevance check returned 62 air pollution stories from *The News & Observer*, 23 from *The News & Record* and 18 from *The Herald-Sun*, Alamance County's "total air pollution stories" was 103 (62+23+18). If a county received none of the top eight newspapers, its "total air pollution stories" variable was 0. For each article, these descriptive variables were also recorded: Newspaper of origin, month/year of publication and status as news or opinion. For a more detailed description of the coding process, refer to Appendix A.

The database search described above indicated the extent to which an environmental issue, air pollution, appears within news coverage. The question of whether that coverage

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[9] According to ABC, "County population and occupied household estimates appearing in ABC reports are obtained from The Nielsen Company (U.S.), Inc. Estimates for ABC defined newspaper markets and areas below the county level are projections based upon The Nielsen Company (U.S.), Inc. estimates.

dominates the news agenda or is a minor element is not answerable with database-search content analysis. Moreover, whether that issue becomes salient to individuals and part of public discussion would require an entirely different type of study. Nonetheless, this study's tally of air pollution stories, viewed over the two-year period, and "matched" with individual counties, does make possible longitudinal and between-county comparisons.

Framing the air pollution discourse

Further, research shows that it is not only the amount of coverage an issue receives but also the *context* of that coverage that matters to readers/viewers (Kensicki, 2004). Therefore, in addition to tallying the number of air pollution stories on a county-by-county basis, the substance of the articles was content analyzed. This will help illustrate, for example, the emphasis placed on air pollution and the information surrounding the issue in the news discourse — characteristics that research shows can influence how individuals understand and react to an issue (Singer & Endreny, 1994). To examine the content at this level, coverage was coded using framing analysis.

Research shows that the "frame" of an article — a "central organizing idea for making sense of relevant events and suggesting what is at issue" — is of particular importance when connecting the public to social issues, including air pollution (Gamson & Modigliani, 1989, p. 3; Kensicki, 2004). Although some mass communication scholars use framing as a theoretical foundation for research, others use it as does this study: as a tool for data analysis. The study measured two primary types of framing dimensions. The first draws on Tankard, who notes that frames supply context "through the use of selection, emphasis, exclusion and elaboration" (2001, p.101). As such, the next recorded variable in the content analysis was the "main topic" of the story; for this project, "main topic" means that if "air

pollution" or a synonymous phrase were removed, the article could not make sense as a complete news story.

Next, coders assessed whether or not the article tied air pollution to physical health at the individual or community levels by citing specific, physical effects of exposure to air pollution (e.g. lung cancer rates, ozone warnings, health department alerts or symptoms of exposure such as itchy eyes or runny noses). This variable is important because the environmental justice literature suggests that the human impact of such environmental problems is often ignored and effects on plant and animal wellbeing emphasized instead (Pezzullo & Sandler, 2007).

The second set of framing questions used Iyengar's episodic/thematic frame typology (1991). He originally applied the typology to political news on television, but Iyengar's argument about journalistic framing — that it provides important cues about who is responsible and what can be done about social problems — resonates across media. Whereas episodic news frames "take the form of a case study or event-oriented report and depict public issues in terms of concrete instances," thematic frames put public issues "in some more general or abstract context [and] present collective or general evidence" (p. 14). Thematic framing provides more "in-depth, interpretive analysis" and places issues in the appropriate historical, geographical or other context; episodic frames, on the other hand, are essentially illustrations of issues and are "devoid of interpretive analysis" (Iyengar, 1991, p 14; 1996, p. 62).

Research shows this difference can affect how news consumers interpret ideas such as blame: "episodic framing tends to elicit individualistic rather than societal attributions of responsibility, while thematic framing has the opposite effect" (Iyengar, 1996, p. 62). Iyengar

connected the prevalence of episodic framing among coverage of political issues to a tendency to misattribute blame for social ills (e.g. poverty) to the individual: "[N]ational issues are traced to private actions and motives rather than deep-seated socioeconomic or political conditions" (1996, p. 62). Because environmental justice scholars trace inequity back to structural issues, it was important to document the extent to which news articles do as well.

Last, the content analysis coded framing "dimensions" or "attributes" that Kensicki created and applied to her content analysis of newspaper coverage of societal problems, including pollution (2004). Echoing Iyengar, Kensicki explains: "By suggesting no cause, effect or responsible agent for these social problems, the media may have helped to create a disconnect between the problem and the actual ramifications" (2004, p. 65). When a story frame includes fewer of these attributes, the connection between the public and the social problem is less clear. In such cases, Kensicki argues that the opportunity to engage citizens in actively solving a societal problem is lost. The extent to which the print air pollution articles include these dimensions could help point out ways North Carolina newspapers might improve their air pollution coverage: cause, effect, victims, solutions, cost and who is responsible for air pollution.

After extensive training and refinement of the protocol, the author and a second coder coded
27 randomly drawn articles (10 percent of the total coded) that matched the proportion each newspaper contributed to the total (e.g. because stories from *The Winton-Salem Journal* made up 10 percent of total air pollution articles, 3 articles (10 percent of 27) were pulled from that paper).

Simple agreement for the descriptive variables — newspaper of origin, month and year of publication, news or opinion designation — was 1 (27/27). For the substantive variables, simple agreement follows: for main topic of air pollution, .93 (25/27); for episodic or thematic framing, .89 (24/27); and, for tying air pollution to physical health, .93 (25/27). For presence/absence for each dimension, simple agreement was .89 (24/27) for cause, .93 (25/27) for effect, .96 (26/27) for solutions, .93 (25/27) for who is responsible, .85 (23/27) for cost and .93 (25/27) for victims.

Scott's *Pi*, which corrects for chance agreement, was as follows: .91 for main topic of air pollution; .86 for episodic or thematic framing; .91 for tie to physical health; .86 for cause; .91 for effect; .95 for solution; .91 for who is responsible; .80 for cost, and .91 for victims.

Including statewide survey responses

To complement the county data, results from a RDD survey (n = 406) from October 30, 2010, to December 2, 2010, were included. Trained interviewers from a university call center focused on North Carolina adults (18 and older) and started with sample of 2000 randomly selected numbers. Of these, not all were viable numbers (i.e., callers excluded fax machines, pages, non-working and business numbers, language barriers and households with no adult present). Interviews lasted approximately 15 minutes and were completed with 406 respondents. The response rate was 29 percent, and sampling error associated with a probability sample of 406 is +/- 4.9 percent at the 95 percent confidence level (AAPOR, 2010). However, sampling error is only one source of error in survey research.

Moreover, because simple random sampling tends to reflect residential telephone population concentration in urban and metropolitan areas, and thus tends to underrepresent

citizens living in rural areas — with some counties generating no respondents at all — the sampling design for this survey deliberately oversampled rural counties in order to explore urban-rural differences. Like the actual population distribution in North Carolina, approximately half the respondents were from rural counties and half were from urban areas.

Only selected survey questions were analyzed. To capture *"general environmental health risk:"* "Now, I want to ask about the people where you live. On a scale ranging from 0 to 10, with 0 being no risk and 10 being extremely high risk, how would you rate the risk of suffering any kind of health problems because of the environment for the people where you live?" To provide a comparison point with the specific problem addressed in the content analysis, air pollution, two additional variables were included. The question capturing "comparative air quality," asked "Now, I'm going to ask you how the people in (respondent's county name) county compare to people in other counties in North Carolina in several ways. How about the air quality — how clean and healthy it is — in your county?" One (1) indicated "much better", and 5 indicated "much worse." For "general air quality," respondents were asked, "How much of a problem is unacceptable outdoor air quality because of air pollution?" using the scale where 1 is "not serious at all," and 5 is "very serious."

Media exposure was measured with a separate variable for each media type: "On average, how many minutes per day do you spend watching national news shows on television?:" "How many minutes per day do you watch a local television news show?;" "About how much time, in minutes, do you spend reading a newspaper each day?;" "How many minutes do you typically spend each day reading or watching news on the Web or Internet?" *Media performance* was similarly divided according to medium, and respondents

used a Likert scale (1 was "very poor;" 5 was "very good") to answer this question: "How good a job does the local television/newspaper/Web do in informing you about things you can personally do to deal with health risks related to the environment?"

For all analyses involving survey responses, county-level means for each relevant question were computed. Although aggregating responses means individual-level responses were essentially lost, the decision was important to maintain a consistent unit of analysis, the county. Additionally, any analysis using survey questions only included counties (n=67) with at least two respondents. Limiting the analysis in this way prevented individuals who were possibly outliers from representing an entire county and thus distorting conclusions drawn from any significant correlations.

CHAPTER 4

RESULTS

This project brought together five disparate data sources, described in detail in
Chapter 3: Census-generated demographic data for each of North Carolina's 100 counties;
objective measures of health and environmental risk from the Robert Wood Johnson
Foundation report; an assessment of the media diet serving each county; findings from a
content analysis of air pollution stories in the state's top eight daily newspapers; and, where
possible, responses from a statewide RDD survey of North Carolina residents.

Preliminary Analyses

Table 1 illustrates important demographic information collected for each county: total
population, percentage of population nonwhite, per capita income, percentage of residents
living below federal poverty level and an urban/rural designation.

Table 2 shows the relevant ranks the RWJF report assigned to each county for health
outcomes, health factors, physical environment and air quality.

Table 3 tracks the frequency if various media sources serving each county, including
the variable "top 8 newspapers," or how many of the state's largest 8 dailies serve that
county.

For the content analysis portion of the study, 273 newspaper articles were coded.
More than half of the sample — 146 articles — came from the two largest papers, *The*

Raleigh News & Observer and *The Charlotte Observer*, which reach into 45 and 23 counties, respectively. Total articles from the remaining six papers ranged from 23 to 4.

Forty-one percent (112) of all the articles featured air pollution as the main topic. Eighty-eight percent (241) discussed air pollution in the context of a specific news event or development, a type of news presentation also known as an "episodic news frame." Thirty-six percent (97) of the articles tied air pollution to the physical health of humans, and 59 percent (162) of the stories appeared in a news section of the paper — as opposed to letters to the editor or staff editorial.

In terms of the "dimensions" of coverage — one way to measure the quality of contextual information an article provides about environmental problems — 68 percent (186) of the stories mentioned one or more causes of air pollution. Thirty-three percent (90) mentioned one or more effects of air pollution. Sixty-one percent (167) of stories mentioned one or more solutions to air pollution. Twenty-five percent (67) cited who or what agent was responsible for the air pollution. Seventeen percent (47) of the stories indicated how much it would cost to solve air pollution problems, and 20 percent (55) of stories included who would be or are the victims of air pollution problems. *Table 4* offers a paper-by-paper breakdown of results based on these variables.

To gauge residents' perceptions of environmental health risks generally and of specific types, the analysis included RDD data where possible. Consistent with other statewide RDD surveys, this survey sample overrepresented women; they made up a greater proportion (57 percent) of the completed sample than men. The mean age for all respondents was 53.3 years, 53 percent of the sample made $60,000 or less as a household, and the majority of respondents (95 percent) had at least graduated from high school. Forty-three

percent had graduated college or enrolled in postgraduate studies. Seventy-five percent of respondents were white, 20 percent were black, and 1.2 percent were Hispanic/Latino.

Because most statewide surveys use simple random sampling, they tend to over-represent telephone numbers in urban areas. To attempt to better explore urban-rural differences — especially in light of environmental justice assertions about particular risks faced by both populations — and ensure that North Carolina's 85 rural counties were included, this survey deliberately over-sampled rural residents. Mirroring the population distribution of North Carolina, 52 percent of sample respondents came from rural areas.

Table 5 shows county-level mean responses on survey questions used for the analysis, including perceptions of "general environmental health risk" and risks related specifically to air quality.

Data Analysis

Based on the anticipation that poorer and minority populations are typically exposed to greater health and environmental risk, RQ1 asked about the relationship between objective risk assessments — RWJF data — and population demographics in North Carolina counties. Before discussing significant correlations, it is important to highlight the use of rank order correlations in the analyses that follow. Ranks were assigned to each county for each RWJF variable, including the overall constructs of health outcomes and health factors. This meant that even when other variables (e.g. per capital income) were entered as ratio numbers, rank order correlation (Spearman's *rho*) was used. Correlations involving air quality z-score, which were correlated using Pearson's *r*, were the only exceptions.

Keep in mind that for all RWJF variables, an increase in rank corresponds to county being relatively *worse off* than counties with smaller rank numbers. Wake County, for

example, is ranked No. 1 (relatively best) in health outcomes but No. 98 — almost worst —

for physical environment. As such, positive correlations between any demographic variable

and the RWJF rankings indicate that as that demographic factor increases, so too does its

rank — meaning the county is relatively *worse off*. A negative correlation, on the other hand,

indicates that as a demographic variable (or, later, media variable) increases, the county's

rank decreases, indicating a relatively *better* assessment of that variable. *Table 6* shows

findings.

As expected, health outcomes and health factors ranks were significantly related

(.829). Both objective measures were negatively correlated with rank for total county

population (-.371 and -.355) but positively correlated with rank for percent population

nonwhite (.457 and .638). These results, then, show that race-based health disparities still

exist in North Carolina; as the rank for county nonwhite population increases in a county,

that county likely "moves up" toward 100 in rank for health factors and health outcomes —

reflecting a comparatively worse health outcome and health factors assessment than counties

with a smaller rank number.

Consistent with the environmental justice literature, rank for per capita income was

negatively correlated with rank for county health outcomes and health factors (-.751 and -

.798), suggesting that counties with lower per capita mean incomes are relatively worse off in

terms of health circumstances. Likewise, ranks for percentage of population living in poverty

was positively correlated with county ranks for both health outcomes and health factors (.751

and .752); in this case, counties with greater proportions of poor residents tend to be

relatively less healthy. Perhaps surprisingly, however, per capita income was positively

correlated with physical environmental rank (.215). This finding might reflect the fact that

often, people with higher incomes tend to congregate in urban living centers, where high-paying jobs are located but air pollution is a greater threat.

As previous rural/urban health comparisons have demonstrated, urban settings might lead to greater types of specific environmental health risks, such as pollution, but urban counties are not less healthy overall: urban counties had relatively higher (worse) physical environment ranks (-.264), but being rural correlated positively with higher ranks (worse) for health outcomes and factors (.386 and .387). When looking specifically at counties' air quality z-scores (one way that RWJF calculated the physical environment rank), the same holds: counties with higher ranks (greater) populations and per capita income had relatively more poor air quality days (.665 for population and .414 for per capita income). Similarly, urban counties had significantly more poor air quality days than rural ones (-.563, where urban = 0 and rural = 1).

Again, these relationships could reflect the concentration of air pollution in urban counties, where more drivers and more traffic lead to smog. It is also possible that the RWJF criteria for air quality — ozone days and particulate matter — correlate with air quality issues specific to cities, and that the air pollution in rural areas (e.g. fumes from hog waste lagoons) are not included in these measurements.
Interestingly, though, rank for percentage of population living in poverty was negatively correlated (-.337) with number of poor air quality days. This could point to where poorer North Carolinians tend to live: in rural areas, where the specific problem of air pollution is relatively less of a threat than in urban ones.

Based on the assumption that citizens facing greater environmental health threats should, ideally, have access to more sources of information about those threats, RQ2 asked

about the media diet serving counties with higher and lower risk assessments based on the RWJ data for health outcomes, health factors and physical environment rank as well as each county's air quality z-score. To measure these relationships, the *potential media diet* variables — total number of daily newspapers, weekly newspapers, African-American newspapers, Spanish-language newspapers, TV stations and radio stations and a separate summed "total print sources" for each county — were correlated (Spearman's) with each county's rank for each RWJ category. *Table 7* illustrates these relationships.

With the exception of daily newspapers, frequencies of media outlets in each county were negatively related to ranks for health outcomes and health factors: total weekly newspapers (-.307 and -.351); total African-American newspapers (-.320 and -.310); total Spanish-language newspapers (-.284 and -.298); total TV stations (-.333 and -.325); total ratio stations (-.336 and -.386) and total print sources (-.384 and -.395). These findings suggest that, overall, relatively less healthy counties have fewer media outlets. Of course, it is important to recognize that media presence is at least in part a reflection of population; a larger potential audience in the county could itself contribute to higher frequencies of certain kinds of media outlets.

While this imbalance could create problems with disseminating health and environmental risk in general, the landscape changes when only physical environment rank was used in correlations. The only significant relationships between physical environment rank and media variables were positive: counties with higher (worse) physical environment ranks likely have more African-American (.292) and Spanish-language (.209) newspapers. To be sure, this finding could point to increased opportunities for these minority populations to learn about environmental health threats, particularly pollution, through specialized

publications. On the other hand, it also confirms that, as environmental justice studies demonstrate, these types of problems could be most severe in areas with greater proportions of these marginal minority groups.

Because evidence shows that people rely on print sources for environmental risk information, RQ3 asked about the relationship between county-level objective measures of risk — RWJF data — and mainstream print media coverage of risk in the outlets serving each county. Only the air pollution discourse in the state's largest general audience dailies served was assessed, and the following variables were measured using content analysis of that coverage: air pollution as a main topic, framing (episodic or thematic), air pollution presented as linked to human health, and story placement (news or opinion section). Results appear in *Table 8*.

Before discussing significant relationships, it is important to discuss several data computation operations that were performed prior to additional correlation analyses. For each substantive variable X measured in the content analysis — main topic, tie to physical health, episodic or thematic frame, and news or opinion placement — a total penetration figure for each county was calculated to form "percent penetration for X variable." Simply, this computed measure reflects the total amount of variable X potentially available to residents of the county by way of any of the state's top eight newspapers serving the county.

To do this, the number of stories in each of the top eight newspapers identifying variable X was multiplied by the circulation figure for the newspapers serving the county in question. In Chatham County, for example, 3,552 households receive *The Raleigh News & Observer*, 428 households receive *The Durham Herald-Sun* and 902 households receive *The Greensboro News & Record*. Of the total 62 air pollution stories from *The News & Observer*,

19 portrayed air pollution as the main topic. Of the total 18 air pollution stories from *The Durham Herald-Sun*, 9 portrayed air pollution as the main topic. Of the total 23 air pollution articles from *The Greensboro New & Record*, 7 portrayed air pollution as the main topic. So, Chatham County's "percent penetration for main topic stories" was formulated using this equation:

((Stories with air pollution as main topic 1 x household circulation of paper 1 in county) + (stories with air pollution as main topic in paper 2 x household circulation of paper 2 in county) + (stories with air pollution as main topic in paper 3 x household circulation for paper 3 in county) + ...) / total households in county

For Chatham County, the equation looked like this:

$$((19 \times 3{,}552) + (9 \times 428) + (7 \times 902)) / 25{,}526 = 3.04$$

To be sure, creating these penetration measures offers only a rough approximation of how many residents in each county could read stories with certain content about air pollution. In the above example, it is impossible to know whether or not 3.04 percent of Chatham County residents actually read an article where air pollution was the main topic. Instead, what this process provides is a standardized way to evaluate potential reach of these stories and assess between-county comparisons.

The general pattern — negative correlations — shows that there are meaningful trends in how air pollution is presented in counties that are relatively worse off (higher ranks). First, counties with worse (higher) ranks for health outcomes and health factors were less likely to receive the top 8 papers (-.220 and -.136). And of the air pollution stories distributed by these top 8 papers, counties with worse (higher) health outcomes and health

factors ranks received fewer air pollution stories (-.439 and -.560), and air pollution was the main topic in fewer of those stories that were distributed (-.387 and -.533).

That said, correlations using physical environment ranks and z-scores for air quality (the objective measures most closely tied to air pollution, the subject of the content analysis) illustrate some heartening trends in terms of availability of stories about air pollution. Specifically, counties with higher (worse) physical environmental health ranks and higher air quality z-scores (worse) had greater percentage penetration of top 8 newspapers (.275 and .450), and the percentage penetration of air pollution stories within those papers was greater (.306 and .598). In terms of the articles themselves, counties with higher (worse) physical environmental rank and air quality z-scores were more likely to receive stories where air pollution was the main topic (.332 and .597), more likely to receive stories where air pollution was connected to physical health (.340 and .599) and more likely to receive stories where air pollution appeared in news sections. Taken together, these relationships suggest that coverage in the top 8 newspapers is highlighting the importance of air pollution as a news — rather than opinion — issue and portraying it as a risk to human health in areas where it is indeed more problematic.

The only possible shortcoming is that episodic framing of news stories was significantly correlated with higher (worse) physical environment rank and air quality z-scores (.310 and .594). This finding could suggest that residents in counties with worse physical environmental circumstances only receive information about air pollution in an event-driven context (e.g. ozone pollution is a threat today but not necessarily tomorrow or the day after). That is, the news coverage those counties receive does not illuminate the

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consistent and ongoing ("thematic") nature of the threat that air pollution poses to residents in those counties.

Previous studies show that reliance on certain types of media can influence an individual's environmental risk perceptions, so RQ4 asked about the relationship between North Carolina residents' risk perceptions, objective risk measurements and reported use of media. As with all analyses using the survey data in this project, responses were aggregated at the county level, so variables for media use reflect the average of all respondents from that county. Admittedly, some county scores reflected small numbers of respondents (the smallest included in this portion of the analysis was 2) where other counties reflected as many as 42. Correlations were performed on the *media use* variables by type, survey questions about perceived environmental health risk (overall and specific to air pollution) and ranks for the RWJF data. *Table 9* shows those relationships.

The only significant relationship between the RWJF rankings and reported use of media was with local TV news; specifically, county mean for time spent watching local TV news was correlated with a higher (worse) health factors rank (.274). Residents who watch more local TV news tend to live in relatively less healthy counties in terms of health behaviors, clinical care, socioeconomic factors and physical environment. Looking at mean responses for environmental risk questions and objective measures of risk, though, the lack of significant relationships could point to important information gaps. Although weak, the correlations coefficients between mean responses about comparative air quality to both physical environment rank and air quality z-score were negative. This could suggest that respondents in counties that were comparatively worse off rated the quality of their air as comparatively better. If so, that would mean that respondents' perceptions do not match

objective measures of this specific risk. That said, the positive direction of the relationship between mean responses about seriousness of general air quality ("How much of a problem is unacceptable outdoor air quality where you live?") and number of poor air quality days, while statistically insignificant, could indicate that when asked about specific environmental problems, people's perceptions are more accurate than when they are asked to assess environmental health risks in general.

Survey respondents in previous studies have evaluated and rated media coverage of environmental issues, including risk, fairly negatively, so RQ5 asked about the relationship between aggregated perceptions of media performance and media coverage of air pollution. As the lower portion of *Table 9* illustrates, only mean responses for performance of local newspaper and physical environmental rank were significantly correlated. Specifically, respondents in counties with higher (worse) physical environment ranks rated their local newspapers as performing better in terms of arming them with information about environmental health risks (.330).

Table 10 shows correlations between questions about newspaper performance and the characteristics of print air pollution coverage collected during the content analysis. Recall that only print coverage from the 8 largest dailies in the state was analyzed. Thus, any county-level data about air pollution coverage reflects how many and which of the top 8 papers serve that county. Prior to performing this analysis, the total penetration of the top 8 newspapers, air pollution stories as well as story characteristics (main topic, episodic or thematic framing, tie to health and news or opinion placement) was calculated. To do so, the proportion (percent) of stories matching each response for each paper was calculated. Next,

those proportions were multiplied by the circulation figures for each top 8 paper serving that county and divided by the total number of households in the county.

None of these variables — either percent penetration of certain story features or more general figures about availability of stories — correlated with mean ratings for newspaper performance in either direction. Of course, it is important to keep in mind the respondents were answering about newspaper performance in general, and the content analysis tracked the discourse of a very specific type of environmental problem.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

Like any research project, this study is not without its limitation. First, the reliance on

rank order correlations means that, in some cases, small differences in variable measurements

were amplified and larger ones obscured. Next, it is important to remember than any

conclusions drawn from these demographic data cannot be generalized beyond North

Carolina, and the content analysis assessed only print coverage of a single environmental

justice issue in the largest daily newspapers. As such, no assumptions can be made about

how other types of media would cover air pollution or how print sources might portray a

different type of environmental health threat. What is more, even with the deliberate over-

sampling of rural telephone numbers, many counties were either left out of the sample or

represented by a single respondent. That is, all analyses using survey data included only

those 67 counties with at least two respondents. Findings involving the survey data must be

considered as suggestive in light of this fact.

Last, problems innate to the objective measures of environmental risk used for the

above analyses cannot be ignored. As the RWJF report itself explains, isolating a single rank

(this study used physical environment rank) can be misleading because it is the *combination*

of the contributing factors that lead to an accurate rank score for the overall measures of

health outcomes and health factors. Although air pollution was the only specific

environmental risk measured in the report, the RWJF uses only two criteria — particulate

matter days and ozone days — to compile the "air quality" portion of the physical environment rank. The figures are not only dated (data came from 2005), but they also reflect the number and placement of air quality sensors — details not available from the report or its authors. Moreover, the report comes after a series of statistical calculations and theoretical modeling that, while helpful as a base tool for comparison, might not lead directly to concrete recommendations to improve health and wellbeing from the perspective of policy makers and public health professionals.

Nonetheless, the results discussed here illustrate that despite important strides to correct long-standing disparities in North Carolina, important inequalities persist. Counties that are rural, populated with more poor people and more nonwhite residents are, overall, least healthy. If nothing else, this study confirms that the "race versus class" debate might actually be distracting from effective ways to correct such inequity, as both factors seem connected to poorer health conditions. Rather than align themselves with one side or the other, academics investigating environmental in/justice, like the media covering public health, should emphasize the dual roots of health disparities in this state. Indeed, policy makers at all levels of government rely on work from both these sectors — scholastic literature and investigative journalism — to not only illuminate these disparities but also explore solutions for ending them.

Looking at a specific type of environmental health risk, air pollution, proved slightly less worrisome (or fruitful, in terms of rural counties). In that case, urban counties where people make more money are actually worse off, and percentage of the population that is nonwhite was not correlated with worse air conditions. This does not mean that environmental justice activists or media can ignore the role that race and income play in

exposure to potentially dangerous air pollutants. Rather, it reinforces the fact that the environmental justice landscape remains varied and depends on population characteristics and geographic scope. Environmental justice activists, for example, cannot overlook urban areas just because they are more healthy than rural ones overall.

Instead, 21st-century environmental justice advocates should consider pinpointing specific types of threats to investigate and push government and industry to develop situation-specific regulations based on the unique impact a threat poses to one group or another. Car-generated smog in Mecklenburg County, for example, should not necessarily be handled the same way as hog waste distributed en masse over rural residents' yards in Halifax County. Furthermore, it could be helpful to break down analyses of environmental health threats to smaller levels, such as a neighborhood or zip code. Such steps could help illuminate if pockets of poor, nonwhite residents face disproportionate levels of air pollution within already more polluted counties.

Further, the trends reported here suggest that rural-urban differences remain an important first step to understanding health dynamics in the state. That is, that while air pollution might not be as salient an environmental health risk in rural counties, these populations could endure other risks or exposures that contribute, along with lifestyle and socioeconomic factors, to those residents' poor health statistics. Future studies should consider a broader range of issues proposed by environmental justice and health scholars when investigating these disparities and consider what early environmental justice advocates fought to remind mainstream environmentalists: That is, the "environment" extends to where people work, play and live. Surveys or geographers trying to objectively assess environmental risks must touch on all of these facets of life.

Precise, geographic-specific data could further complement these studies in key ways. Whereas air pollution defined as ozone might not be a problem in county X, for example, exposures to coal ash, pesticides or work-related chemicals could be dangerously high. A follow-up study could survey residents about subjective knowledge and information sources related to specific types of environmental health risks *known* to be problematic in their counties. Creating questions tailored to respondents' counties might help public health officials determine how to prioritize information campaigns about different issues in different areas. If residents' perceptions of mercury-contaminated water seems to match the level of risk in their area, for example, then the offices and organizations related to public health could devote attention and funds to issues where the need for information remains high.

The examination of each county's media diet in light of its relative health and environmental risk paints a picture of both helpful and potentially harmful trends. First, less healthy counties have, overall, fewer sources in their repertoire of media sources. Insofar as the media provide information about healthy lifestyle changes, where to find health-related information and how health has community-wide consequences, these counties are grossly underserved. Correcting that imbalance should be a priority not only for producers of media content but also for public health officials, who might need to fill gaps left by such a sparse media environment. Surveys about where and in what contexts people search for health and environmental risk information could help these and others in the health sector identify more effective strategies for allotting resources to generating media attention as opposed to pursuing personal communication programs or launching large-scale information campaigns.

When media coverage of air pollution is considered alone, however, the situation is not as grim. In fact, findings from this study suggest that at the county level, print coverage

of air pollution matches the threat it poses those residents. Counties relatively worse off in terms of physical environmental conditions and air quality have more opportunities to read air pollution-focused stories that portray it as a legitimate bodily threat. The importance of this connection cannot be emphasized enough. Consider the average person's experience with air pollution: with the exception of smog that drifts from the highway on hot summer days, air pollution remains an invisible, tasteless and odorless presence in our lives. Yet its detrimental impact on the human body is well documented. Like other "unobtrusive" or rarely noticed environmental health threats, air pollution requires extra vigilance on the part of the media to make these connections clearly and consistently.

It is important to remember that this content analysis did not track where the air pollution cited the article was most pervasive. It is possible, then, that despite more stories in more threatened areas, the air pollution threat discussed in the story might not have been applicable to all readers. For example, rural residents receiving *The Charlotte Observer* might have read stories about air pollution in downtown Mecklenburg County — hardly a relevant risk for a farmer outside the city limits. Particularly because air pollution is so closely tied to urban population density (in this study and others) the coverage of the issue inside and outside urban areas merits further attention. A particularly helpful study, for instance, would combine air pollution data from rural areas and track the air pollution discourse in weekly and semi-weekly newspapers. This would provide a much more accurate assessment of both how often and in what contexts residents outside urban centers have opportunities to learn about the issue.

One improvement for coverage of air pollution concerns the preponderance of episodically framed air pollution stories. In both urban and rural areas, this data suggests that

North Carolinians do not read about air pollution as a sustained threat but as an event-driven problem with a time limit. This is particularly important in light of the lack of relationships between residents' perceptions and objective measures of environmental risk. Although statistically insignificant, the negative direction of correlations coefficients between perceptions of air quality risks and objective assessments justifies future attention. Could the media's framing of air pollution as a one-time problem (e.g. caused by a single factory or one smoggy day) lead people to believe air pollution is not a chronic problem and thus, does not warrant the attention of lawmakers or industry regulators? For air pollution and other environmental health risks, both individuals and communities in North Carolina stand to gain from bringing perceptions of risk in line with reality.

Finally, tracking the "dimensions" of air pollution coverage shows that compared to previous analyses of print coverage of environmental problems, newspapers in this sample more substantively explain the complexities of air pollution. To be sure, the low percentages of stories that cited responsible agents, victims and costs of fixing air pollution-related problems point to gaps that reporters, editors and scientific sources should keep in mind. The one-fifth of stories mentioning victims is higher than other studies that examined this dimension but still troublesome for environmental justice activists, who must emphasize *who* is at risk to illustrate systematic and structural inequalities. The large proportion of stories that mentioned causes, effects and solutions to air pollution, on the other hand, shows that print media are indeed working to portray the issue in a thorough way. As communication, public health and environmental science scholars will attest: the public must continue to see air pollution not as inevitable or intractable but as a ongoing danger that requires constant attention and, when appropriate, regulation.

As with most media and health-related studies, this project creates more questions than it answers. Hopefully, though, combining these data sources and utilizing various methods offers a template for how to approach the complex world that is risk communication. Because as multi-faceted and dynamic as that topic is, it is one that is vital and relevant to everyone, from individual citizens to local health officials to state representatives in Congress. That same recognition — the confluence of information and personal behavior and systematic inequalities — should inform both academic and activists-led environmental justice work. This data illustrate air pollution might not be among the top priorities for these advocates, but the larger imbalance of healthiness requires asking what other environmental justice-related issues could problematic.

This study offers only a limited and introductory analysis of the role media play in the environmental health risk dynamic. And to be sure, sorting out such dense issues requires time, patience and innovation. But media should not be relieved of their responsibility to contribute to generating solutions. The hope is that by asking how media might affect and improve peoples' understanding of environmental health risks, future studies can make more concrete and actionable recommendations to all those involved. A great deal rides on turning around North Carolina's history of environmental injustice and ending the health disparities confirmed by this study — just ask the residents of New Hill.

Table 1

County-level Demographic Data Collected from U.S. Census Bureau and North Carolina
Rural Economic Development Center

County	Population	Pct. Pop. Nonwhite	Per Capita Income (2009 U.S. Dollars)	Pct. Poverty	U/R (Urban=0; 1=Rural)
Alamance	144769	29.36	22509	15.8	0
Alexander	36278	10.89	20453	12.7	1
Alleghany	10905	15.12	19944	18.5	1
Anson	25243	51.39	16974	23.4	1
Ashe	25467	4.57	20706	15.8	1
Avery	17903	8.24	24915	17.6	1
Beaufort	45993	31.53	22220	19.1	1
Bertie	19187	64.28	17058	23.3	1
Bladen	32412	42.68	16938	24	1
Brunswick	98712	15.68	25993	11.9	1
Buncombe	225869	11.24	26209	13.9	0
Burke	88987	14.53	18341	15.5	1
Cabarrus	161473	20.24	26128	9.9	0
Caldwell	79382	10.13	19860	15.4	1
Camden	9375	19.52	24639	8.7	1
Carteret	63369	11.44	26588	11.8	1
Caswell	23228	36.44	17443	18.9	1
Catawba	155157	17.83	22789	18.9	0
Chatham	61444	23.16	28448	10.3	1
Cherokee	26203	6.28	19953	17.9	1

County	Population	Pct. Pop. Nonwhite	Per Capita Income (2009 U.S. Dollars)	Pct. Poverty	U/R (Urban=0; 1=Rural)
Cleveland	98331	23.37	18978	17.5	1
Columbus	54050	37.22	18189	21.9	1
Craven	96789	29.52	23968	14.9	1
Cumberland	309316	46.16	21728	15.8	0
Currituck	23713	10.08	25210	9.7	1
Dare	33976	5.82	30763	9.3	1
Davidson	156033	13.77	22042	14.5	0
Davie	40297	11.38	25929	10.8	1
Duplin	52358	42.02	16333	20.5	1
Durham	256296	51.37	27698	13.8	0
Edgecombe	52586	60.15	16417	22.6	1
Forsyth	346851	34.7	26189	14.9	0
Franklin	57201	33.14	20537	14.1	1
Gaston	202149	20.61	21955	15.1	0
Gates	11555	38.54	19337	15.7	1
Graham	7964	10.17	17652	17.7	1
Granville	55670	40.41	21201	13.7	1
Greene	20402	49.59	17275	21.7	1
Guilford	464041	39.25	26389	13.6	0
Halifax	55118	58.81	17162	23.7	1
Harnett	108885	30.92	19338	15.2	1

Haywood	56535	4.05	23514	14.5	1
Henderson	100333	10.86	25312	12.7	1
Hertford	23281	63.78	16149	22.7	1

County	Population	Pct. Pop. Nonwhite	Per Capita Income (2009 U.S. Dollars)	Pct. Poverty	U/R (Urban=0; 1=Rural)
Hoke	42410	52.13	16831	19.6	1
Hyde	5256	43.49	16314	22.4	1
Iredell	150346	17.84	25018	11.6	1
Jackson	36447	16.14	20219	16.9	1
Johnston	156888	21.66	22661	12.7	1
Jones	10028	37.38	18752	18	1
Lee	57919	33.61	20641	13.9	1
Lenoir	56831	45.71	18877	23.5	1
Lincoln	72728	12.06	22734	12.4	1
McDowell	43587	7.5	18773	14.6	1
Macon	32607	5.49	25751	13.8	1
Madison	20227	3.31	18717	17.7	1
Martin	23699	47.67	18053	23.4	1
Mecklenburg	861189	39.09	32432	10.9	0
Mitchell	15690	3.54	18522	17.2	1
Montgomery	27456	32.63	17308	19.6	1
Moore	84280	19.22	24072	11.6	1
Nash	92814	41.72	23327	15.5	1
New Hanover	189463	20.48	29148	14	0
Northampton	20611	59.57	16956	26.6	1
Onslow	165181	26.69	20783	14.8	1
Orange	124503	24.19	32198	13.9	0

| Pamlico | 12470 | 25.54 | 21669 | 16.3 | 1 |

County	Population	Pct. Pop. Nonwhite	Per Capita Income (2009 U.S. Dollars)	Pct. Poverty	U/R (Urban=0; 1=Rural)
Pasquotank	40334	42.39	21077	17.3	1
Pender	49408	23.91	21952	14.8	1
Perquimans	12367	27.4	20532	18.1	1
Person	37301	30.88	22016	13.7	1
Pitt	151931	38.78	21622	22	1
Polk	19107	7.03	22513	12.3	1
Randolph	139443	13.75	20978	14.1	1
Richmond	45947	37.13	17635	23.7	1
Robeson	127686	67.14	15128	30.4	1
Rockingham	92007	23.79	20284	16.2	1
Rowan	137387	21.09	21779	15.6	0
Rutherford	63153	13.76	19030	16.8	1
Sampson	62996	43.02	18295	22.1	1
Scotland	36394	50.09	16612	27.6	1
Stanly	59136	16.55	20917	12.7	1
Stokes	45916	6.3	20117	14.9	1
Surry	72166	7.96	19868	15.9	1
Swain	13367	31.72	18742	16.1	1
Transylvania	29886	7.97	23740	12.4	1
Tyrrell	4112	43.04	17033	26.9	1
Union	181852	18.57	27649	8.6	1
Vance	42987	55.21	17510	25.7	1

| Wake | 828759 | 30.92 | 32234 | 9.2 | 0 |

County	Population	Pct. Pop. Nonwhite	Per Capita Income (2009 U.S. Dollars)	Pct. Poverty	U/R (Urban=0; 1=Rural)
Warren	19545	60.85	18037	24.4	1
Washington	12979	54.4	17716	23.2	1
Watauga	44636	4.66	21534	18.9	1
Wayne	113290	39.33	20036	18.3	1
Wilkes	66563	9.61	19578	20.9	1
Wilson	76765	46.54	20698	21	1
Yadkin	37520	9.68	19597	13.8	1
Yancey	18336	2.73	17939	18.4	1

Table 2
County-level Ranks Assigned by Robert Wood Johnson Foundation Report for North Carolina,"County Health Rankings: Mobilizing Action Toward Community Health"

County	Health Outcomes Rank	Health Factors Rank	Physical Envt. Rank	Air Quality Rank
Alamance	26	28	41	48
Alexander	60	34	36	82
Alleghany	74	48	71	17
Anson	87	92	60	22
Ashe	29	37	9	1
Avery	52	46	86	68
Beaufort	80	67	73	56
Bertie	99	89	64	1
Bladen	97	77	29	56
Brunswick	43	32	11	36
Buncombe	25	3	13	46
Burke	72	56	69	68
Cabarrus	9	22	95	97
Caldwell	58	45	63	68
Camden	30	38	81	1
Carteret	27	24	50	1
Caswell	55	71	81	34
Catawba	18	12	52	92
Chatham	4	11	49	46
Cherokee	83	55	31	22

| Chowan | 50 | 69 | 23 | 36 |
| Clay | 19 | 21 | 4 | 53 |

County	Health Outcomes Rank	Health Factors Rank	Physical Envt. Rank	Air Quality Rank
Cleveland	79	65	27	61
Columbus	100	97	94	75
Craven	24	26	10	1
Cumberland	54	54	67	88
Currituck	40	51	89	1
Dare	7	25	24	1
Davidson	41	58	77	87
Davie	37	23	34	84
Duplin	73	83	28	36
Durham	11	8	66	74
Edgecombe	94	99	65	54
Forsyth	20	20	97	96
Franklin	36	44	21	72
Gaston	70	49	47	86
Gates	66	47	88	1
Graham	76	86	40	77
Granville	49	70	96	93
Greene	69	73	85	61
Guilford	10	17	78	81
Halifax	96	93	6	17
Harnett	35	63	42	68
Haywood	56	19	72	85

Henderson	33	5	30	29
Hertford	93	78	54	1

County	Health Outcomes Rank	Health Factors Rank	Physical Envt. Rank	Air Quality Rank
Hoke	57	75	1	36
Hyde	34	81	75	1
Iredell	21	29	84	91
Jackson	12	31	35	22
Johnston	32	50	58	89
Jones	82	68	18	1
Lee	46	59	61	48
Lenoir	88	84	59	79
Lincoln	22	33	92	94
McDowell	51	52	80	80
Macon	44	15	51	22
Madison	14	18	3	29
Martin	95	87	93	61
Mecklenburg	5	14	100	100
Mitchell	84	27	16	22
Montgomery	59	79	22	29
Moore	31	9	12	17
Nash	61	61	15	34
New Hanover	6	7	68	78
Northampton	89	94	83	17
Onslow	15	43	5	36
Orange	2	1	32	60

Pamlico	39	35	56	1
Pasquotank	28	66	26	1

County	Health Outcomes Rank	Health Factors Rank	Physical Envt. Rank	Air Quality Rank
Pender	38	40	57	36
Perquimans	75	72	39	1
Person	47	74	91	67
Pitt	45	39	62	73
Polk	23	4	8	29
Randolph	13	41	33	48
Richmond	90	90	17	1
Robeson	98	100	19	36
Rockingham	71	85	48	55
Rowan	62	64	99	99
Rutherford	85	42	20	29
Sampson	67	82	45	56
Scotland	86	95	25	36
Stanly	68	36	87	90
Stokes	53	53	54	48
Surry	48	60	37	45
Swain	78	91	14	17
Transylvania	17	6	79	44
Tyrrell	77	88	7	1
Union	3	10	76	95
Vance	91	96	38	22
Wake	1	2	98	98

Warren	92	98	53	22
Washington	65	80	46	56

County	Health Outcomes Rank	Health Factors Rank	Physical Envt. Rank	Air Quality Rank
Watauga	8	16	90	76
Wayne	63	57	43	83
Wilkes	64	62	74	65
Wilson	81	76	70	65
Yadkin	42	30	2	48
Yancey	16	13	44	64

Table 3
Total Frequencies of Media Outlets in Each County

County	Daily Newspapers	Weekly Newspapers	African-American Newspapers	Spanish-Language Newspapers	TV Stations	Radio Stations	Top 8 Papers
Alamance	0	1	0	0	0	3	3
Alexander	0	1	0	0	0	0	1
Alleghany	0	1	0	0	0	1	1
Anson	0	1	0	0	0	0	1
Ashe	0	1	0	0	0	1	1
Avery	0	1	0	0	0	1	2
Beaufort	1	0	0	0	1	0	2
Bertie	0	0	0	0	0	0	2
Bladen	0	1	0	0	0	2	2
Brunswick	0	2	0	0	0	0	3
Buncombe	1	2	0	1	2	14	0
Burke	1	0	0	0	0	4	1
Cabarrus	1	0	0	0	0	2	1
Caldwell	1	0	0	0	0	3	1
Camden	0	0	0	0	0	0	0
Carteret	0	1	0	0	1	3	1
Caswell	0	1	0	0	0	0	2
Catawba	3	0	0	0	1	4	1
Chatham	0	2	0	0	0	1	3
Cherokee	0	2	0	0	0	3	0

| Chowan | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

County	Daily Newspapers	Weekly Newspapers	African-American Newspapers	Spanish-Language Newspapers	TV Stations	Radio Stations	Top 8 Papers
Clay	0	1	0	0	0	0	0
Cleveland	1	1	0	0	0	2	1
Columbus	0	0	0	0	0	3	2
Craven	1	0	0	0	2	15	2
Cumberland	1	1	1	1	0	16	2
Currituck	0	0	0	0	0	0	0
Dare	0	2	0	0	0	10	1
Davidson	1	1	0	0	0	4	2
Davie	0	0	0	0	0	0	1
Duplin	0	1	0	0	0	1	2
Durham	1	1	2	0	3	2	2
Edgecombe	1	0	0	0	0	0	1
Forsyth	1	1	1	1	2	15	2
Franklin	0	0	0	0	0	0	1
Gaston	0	1	0	0	0	1	1
Gates	0	1	0	0	0	0	0
Graham	0	1	0	0	0	0	0
Granville	0	1	0	0	0	1	2
Greene	0	0	0	0	0	0	2
Guilford	2	1	1	0	4	23	2
Halifax	1	1	0	0	0	2	1

Harnett	1	0	0	0	0	3	2
Haywood	0	1	0	0	0	1	0

County	Daily Newspapers	Weekly Newspapers	African-American Newspapers	Spanish-Language Newspapers	TV Stations	Radio Stations	Top 8 Papers
Henderson	0	0	0	0	0	2	0
Hertford	0	1	0	0	0	1	1
Hoke	0	1	0	0	0	1	1
Hyde	0	0	0	0	0	0	0
Iredell	1	1	0	0	0	3	2
Jackson	0	2	0	0	0	2	0
Johnston	0	2	0	0	0	2	1
Jones	0	0	0	0	0	0	0
Lee	1	0	0	0	0	4	2
Lenoir	1	0	0	0	0	2	1
Lincoln	0	1	0	0	0	3	1
McDowell	1	1	0	0	0	0	0
Macon	0	2	0	0	0	4	0
Madison	0	1	0	0	0	0	0
Martin	0	0	0	0	0	1	2
Mecklenburg	1	0	1	6	9	29	1
Mitchell	0	1	0	0	0	1	0
Montgomery	0	1	0	0	0	1	2
Moore	0	1	0	0	0	3	4
Nash	1	1	0	0	0	5	1
New Hanover	1	1	2	2	5	17	2

Northampton	0	0	0	0	0	0	1
Onslow	1	2	0	0	1	1	2

County	Daily Newspapers	Weekly Newspapers	African-American Newspapers	Spanish-Language Newspapers	TV Stations	Radio Stations	Top 8 Papers
Orange	0	1	0	0	0	5	2
Pamlico	0	0	0	0	0	0	1
Pasquotank	1	0	0	0	0	2	1
Pender	0	0	0	0	0	0	2
Perquimans	0	0	0	0	0	0	1
Person	0	1	0	0	0	1	2
Pitt	1	1	3	0	3	9	2
Polk	1	1	0	0	0	1	0
Randolph	1	1	0	0	0	1	1
Richmond	1	0	0	0	0	4	2
Robeson	0	1	0	0	1	0	2
Rockingham	0	0	0	0	0	3	2
Rowan	0	0	0	0	0	2	1
Rutherford	1	0	0	0	0	5	1
Sampson	1	0	0	0	0	1	2
Scotland	0	0	0	0	0	1	3
Stanly	0	1	0	0	0	2	1
Stokes	0	0	0	0	0	1	2
Surry	1	2	0	0	1	5	1
Swain	0	1	0	0	0	0	0
Transylvania	0	0	0	0	0	2	0

| Tyrrell | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Union | 0 | 1 | 0 | 0 | 0 | 1 | 1 |

County	Daily Newspapers	Weekly Newspapers	African-American Newspapers	Spanish-Language Newspapers	TV Stations	Radio Stations	Top 8 Papers
Vance	1	0	0	0	0	1	2
Wake	1	5	1	2	4	23	2
Warren	0	0	0	0	0	0	1
Washington	0	0	0	0	0	0	2
Watauga	0	3	0	0	0	5	2
Wayne	1	1	0	0	0	5	1
Wilkes	0	1	0	0	0	1	2
Wilson	1	0	0	0	0	1	1
Yadkin	0	1	0	0	0	0	1
Yancey	0	0	0	0	0	1	0

Table 4
Frequencies of Story Characteristics Measured During Content Analysis

Newspaper	Total Air Poll. Stories	Main Topic	Framing: Episodic	Tied to Health	News
The Charlotte Observer	84	54%	87%	37%	61%
The Raleigh News & Observer	62	31%	84%	31%	52%
The Greensboro News & Record	23	30%	83%	25%	61%
The Winston-Salem Journal	28	32%	96%	54%	57%
The Fayetteville Observer	12	17%	92%	8%	50%
The Wilmington Star News	42	45%	93%	31%	64%
The Durham Herald-Sun	18	50%	89%	56%	67%
The Greenville Daily Reflector	4	50%	100%	75%	100%

Table 5
Descriptive Statistics for Relevant Responses to Statewide RDD Survey

	N	M	SD
Environmental Health Risk			
"How would you rate the risk of suffering any kind of health problems because of the environment for the people where you live?" (0=no risk; 10=extremely high risk)	425	3.24	2.63
Total Environmental Problems (0-12)			
Media Use (Minutes/Day)			
Local TV	407	52.92	85.76
Newspaper	405	21.51	25.02
Internet	406	32.22	45.72
Media Performance			
"How good a job does the local TV news do in informing you things you can personally do to deal with health risks related to the environment?" (1=very poor; 5=very good)	393	3.52	1.13
"How good a job does the local newspaper …?" (1=very poor; 5=very good)	368	3.31	1.22

Table 6

Correlation Coefficients (Spearman's rho) Between County-level Demographic Data and Robert Wood Johnson Assessments

	Health Outcomes	Health Factors	Physical Envt. Rank	Air Quality z-score[a]
Total Population	-.371**	-.355*	.160	.665**
Pct. Pop. Nonwhite	.457**	.638*	.079	-.092
Per Capita Income (2009 U.S. Dollars)	-.751**	-.798**	.215*	.414**
Pct. Poverty	.721*	.752*	-.156	-.337**
Urban/Rural (Urban=0; Rural=1)	.386*	.387*	-.264**	-.563**

*Indicates correlation is significant at the .05 level (two-tailed).
**Indicates correlation is significant at the .01 level (two-tailed).
[a]Because this correlation came from numbers and not rank, Pearson's was used.

Table 7

Correlation Coefficients (Spearman's rho) Between County Media Diet and Robert Wood Johnson Assessments

	Health Outcomes	Health Factors	Physical Envt. Rank	Air Quality z-score[a]
Total Daily Newspapers	-.134	-.093	.043	.264**
Total Weekly Newspapers	-.307**	-.351**	-.137	.130
Total African-American Newspapers	-.320**	-.310**	.292**	.281**
Total Spanish-Language Newspapers	-.284**	-.298**	.209*	.515**
Total Print Sources	-.384**	-.395**	-.019	.468**
Total TV Stations	-.333**	-.325**	.091	.446**
Total Radio Stations	-.336**	-.386**	.120	.454**

*Indicates correlation is significant at the .05 level (two-tailed).
**Indicates correlation is significant at the .01 level (two-tailed).
[a]Because this correlation came from real numbers and not rank, Pearson's was used.

Table 8

Correlation Coefficients (Spearman's rho) Between Air Pollution Stories (total number and characteristics) and Robert Wood Johnson Assessments

	Health Outcomes	Health Factors	Physical Envt. Rank	Air Quality z-score[a]
Total Air Pollution Stories	-.022	.031	.154	.217*
Top 8 Papers (0-8)	.017	.154	.139	.102
Pct. Penetration of Top 8 Papers	-.220*	-.136	.275**	.450**
Pct. Penetration of Air Pollution Stories	-.439**	-.560**	.306**	.598**
Pct. Penetration for Main Topic Stories	-.387**	-.533**	.332**	.597**
Pct. Penetration for Episodic Stories	-.441**	-.566**	.310**	.594**
Pct. Penetration for Health Stories	-.436**	-.572**	.340**	.599**
Pct. Penetration for News Stories	-.437**	-.566**	.316**	.595**

*Indicates correlation is significant at the .05 level (two-tailed).
**Indicates correlation is significant at the .01 level (two-tailed).
[a]Because this correlation came from numbers and not rank, Pearson's was used.

Table 9

Correlation Coefficients (Spearman's rho) Between County-level Mean Survey Responses for Media Use and Perceived Environmental Health Risk Compared to Robert Wood Johnson Foundation Assessments[a]

	Health Outcomes	Health Factors	Physical Envt. Rank	Air Quality z-score[b]
Environmental Risk				
"How would you rate the risk of suffering any kind of health problems because of the environment for the people where you live?" (0=no risk; 10=extremely high risk)	.190	.237	.153	-.153
"How about the air quality where you live — how does it compare to people in other counties?" (1=much better; 5=much worse)	-.030	-.135	-.091	-.175
"How much of a problem is unacceptable outdoor air quality where you live?" (1=not serious at all; 5=very serious)	-.107	-.052	.196	.212
Media Use				

Local TV	.224	.294*	-.067	-.121
Newspaper	.077	.132	-.017	-.112
Internet	-.097	-.085	-.021	.043

	Health Outcomes	Health Factors	Physical Envt. Rank	Air Quality z-score
Media Performance				
"How good a job does the local TV news do informing you about things you can personally do to deal with health risks related to the environment? (1=very poor; 5=very good)	.175	.184	.149	.095
"How good a job does the local newspaper…" (1=very poor; 5=very good)	.095	.020	.330*	.182
"How good a job does the Web or Internet…" (1=very poor; 5=very good)	.189	.159	-.089	-.038

*Indicates correlation is significant at the .05 level (two-tailed).
[a]All correlations based on mean responses from counties with at least 2 respondents (n=67).
[b]Because this correlation came from numbers and not rank, Pearson's was used.

APPENDIX A

Coding Protocol

Please read this protocol carefully before coding articles, and re-read it after taking any breaks during the coding process.

Study goals
This study is concerned with when, where and in what context articles about air pollution appeared in the largest eight daily newspapers in North Carolina from a period of January 1, 2009 through December 31, 2010. In addition to information used to categorize and track the articles, the study is concerned with the emphasis the article placed on the topic of air pollution and among what other issues it was discussed.

Articles included
The search prompt for this study is "air pollution." Even if an article includes this phrase and falls within the designated time period, it must be checked for relevance. Obituaries and stories without any tie to air pollution in the United States will be excluded. Although letters to the editor and editorials (staff and reader-generated) will be included, they will be marked as such (see below). In cases where the only text of an article is a caption for a photo (they will be marked as "CAPTION," the article should also be excluded.

      If an article shows up twice on the results list, it must be verified that either A) it appeared in two different papers or B) the same article was published on different days in the same paper.

      If neither condition is met, the article will be excluded.

Variable definitions
AV1 Name of newspaper (nominal): Identifying information is listed in bold at the top of each of the articles. All articles for this project appear in one of the following papers — *The Charlotte Observer*, *The Raleigh News & Observer*, *The Greensboro News & Record*, *The Winston-Salem Journal*, *The Fayetteville Observer*, *The Wilmington Star-News, The Durham Herald-Sun* or *The Greenville Daily Reflector*.

      Although searching *The Raleigh News & Observer* also produces articles from *The Chapel Hill Herald* (they are owned by the same parent company), these articles should be excluded from the sample and not coded.

AV2 Year of publication (nominal) and **AV3 Month of publication** (nominal): This information comes immediately after the headline and name of the newspaper in the America's Newspapers database information section.

AV4 Main topic of air pollution (nominal): You will answer this question as "yes" or "no."

      To determine whether or not air pollution was the main topic, do not count the number of times it is referenced or if it appears within a certain number of paragraphs. Rather, ask: Is air pollution the reason this article made the paper?

      For example, an article might mention a lawsuit filed against a coal company because of its emissions. Although "air pollution" might appear verbatim only once in an article, the

action of the story — the courtroom drama or judge's decisions — can be traced back to air pollution. Thus, mark "yes."

In another example, air pollution might appear alongside a list of possible benefits from upgrading a transportation system or making changes to one's lifestyle. If it is indeed the case that "air pollution" could be removed and the story stand as is, then "no" should be marked for the main topic.

AV5 Frame type — episodic or thematic (nominal): All articles will be marked as either "episodic" or "thematic."

Shanto Iyengar's episodic versus thematic framing distinction has informed mass communication literature on various media since its 1991 publication. Per his definition, an episodic story frame "focuses on specific events of particular cases" while the thematic news frame puts issues "and events in some general context" (p. 2). Adapting that structure to match the research questions for this study, you can also think of the episodic frame as constructed around spot-news or a one-time event, and "thematic" frames as indicating ongoing, persistent issues, problems or otherwise enduring discussions.

For example, if "air pollution" appears in a story where high ozone levels have led to an announcement for at-risk people to avoid the outdoors for a certain day, that is an episode-driven news story, and the frame should be marked "episodic."

Similarly, if the "air pollution" is tied with a specific facility, proposed project or recent scientific reports about air pollution, then the story should be considered "episodic."

On the other hand, if the article discusses air pollution statistics over time or offers interpretive analysis of air pollution, then the story should be counted as "thematic." Similarly, an editorial mentions action that should be taken to reduce the state's air pollution in general, that should also count as a "thematic" frame.

AV6 Frame focus — physical health (nominal): You will mark this "yes" or "no."

This study is interested in the extent media tie problems associated with air pollution to a person's physical health. This does not mean that a story marked "yes" must include quotes from a citizen who is sick as a result of air pollution. Rather, to qualify as "yes" story, the article must make an explicit link between air pollution and its potential effect on the human body. This might include references to irritated eyes, respiratory distress, coughing or wheezing at the individual level.

Similarly, a story also is marked "yes" if it mentions more widespread impact of air pollution, such as heightened levels of asthma or increased rates of lung cancer.

Many stories list air pollution as a side-effect of other environmental or industry-related issues. Unless they mention air pollution in the context of the health of a person (not the environment in general), then they are marked "no" for this variable.

AV7 News or opinion (nominal): You will mark "news" or opinion."

The best ways to determine which category fits best is to look at the categorizing information below the text of the article. There is a prompt labeled "Section." If the article appeared in sections such as "News," "General news," "Local News," "Features," "Health," or "Metro," then the article should be marked "News."

If the section is marked "Editorial" or "Opinion," it should be marked as such.

However, coders should check for reoccurring columns, such as "Do Your Part" and "In Your Home" in *The Charlotte Observer*, which should be marked opinion.

AV8 Dimensions of coverage — general (nominal): For each of the following dimensions, you will mark "yes" or "no."

According to Kensicki (2004), subtle differences in how media depict social problems inform how readers come to see them as solvable and whether or not individuals can contribute to that resolution. Working from her template, the current research will identify the presence or absence of the following attributes: causes, effects, solutions, who is responsible, costs and victims. To be considered "yes," a dimension must be cited only once, but the reference must be explicit in the text.

It is important to remember that each dimension can be discussed in the past, present or future. For example, a community member who opposes a cement plant because it *would* create air pollution if built still counts as "yes" in the cause dimension. The same goes for potential solutions, would-be victims or after-the-fact effects.

For each article, a "yes/no" will be given according to each dimension:

— Does the article mention what is the *cause* of air pollution? Causes can be attributed to specific events (e.g. high temperatures that trap ozone, which one is main cause of air pollution) or site (e.g. a coal or cement plant) or discussed more generally (e.g. industrial zones and more congested highways both create air pollution). Cause, however, does not mean the same as who is responsible. Rather, cause can be related to what process or fact or trend created the air pollution — even if no company, government group or other identifiable person is cited as the one responsible for it.

— Does the article mention what the *effects* of air pollution are? This can refer to effects on the physical person (see above) as well as policy implications, environmental degradation (e.g. kills forests), wildlife or community health issues, etc.

— Does the article mention *solutions* to lowering levels of air pollution? This can be in the form of a recommendation at the individual level (e.g. stay inside on a high-alert ozone days), private sector (coal technologies should be cleaner) as well as governmental intervention (regulations on industry should be more strict).

— Does the article mention *who* or *what agent is responsible* for the air pollution? If the article mentions the company who will build the coal or cement plant tied to causing pollution, then they fit the *who* category. Similarly, if an author takes the stance that the N.C. General Assembly has an obligation to more heavily restrict power companies, then that body counts as a responsible agent. Keep in mind that more than one agent can be named in each article, but that only the presence of one is required to count as "yes."

— Does the article mention the *costs* of solving the problems associated with air pollution? This can be an explicit reference, such as "Cutting CO_2 emissions will cost the state $4 million in tax revenue," or an industry

spokesperson who states that cleaner technologies are, overall, too expensive to invest in given the current economic climate.

— Does the article mention who the *victims* of air pollution are, or who will be most affected by the issue? This could be phrased as broadly as "Those who live in Western North Carolina can attest to how the unique topography there traps and worsens the effects of air pollution that moves into North Carolina from the TVA's coal-fired plants," or could refer to a specific neighborhood chosen to host a current or proposed incinerator, landfill or other source of air pollution. It also could refer to "vulnerable populations" such as pregnant mothers, children or one racial group — any demographic grouping that makes a person at higher risk counts in this category.

References

Iyengar, S. (1991). *Is Anyone Responsible?: How Television Frames Political Issues.* Chicago: University of Chicago Press.

Kensicki, L. J. (2004). No cure for what ails us: The media-constructed disconnect between societal problems and possible solutions," *Journalism & Mass Communication Quarterly, 81*(1), 53-73.
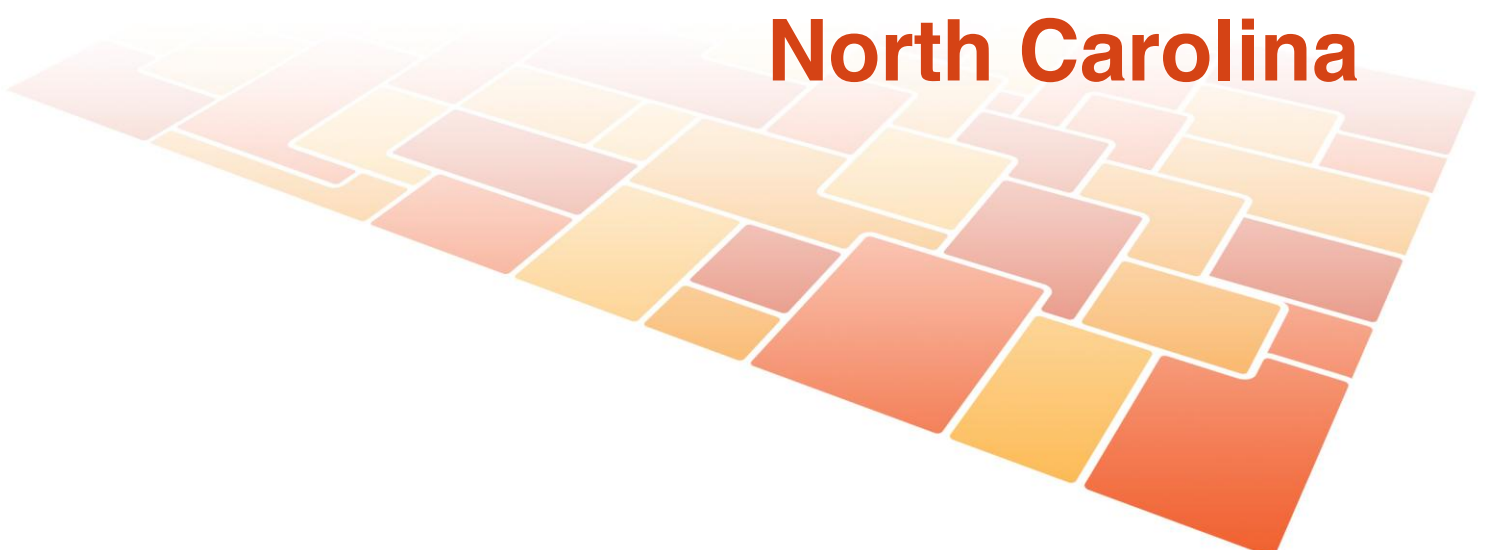
County Health Rankings

Mobilizing Action Toward Community Health

2010
North Carolina

Robert Wood Johnson Foundation

UNIVERSITY OF WISCONSIN
Population Health Institute
*Translating Research into Policy and Practice*

Introduction

Where we live matters to our health. The health of a community depends on many different factors, including quality of health care, individual behavior, education and jobs, and the environment. We can improve a community's health through programs and policies. For example, people who live in communities with ample park and recreation space are more likely to exercise, which reduces heart disease risk. People who live in communities with smoke-free laws are less likely to smoke or to be exposed to second-hand smoke, which reduces lung cancer risk.

The problem is that there are big differences in health across communities, with some places being much healthier than others. And up to now, it has been hard to get a standard way to measure how healthy a county is and see where they can improve.

The Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute are pleased to present the 2010 *County Health Rankings*, a collection of 50 reports that reflect the overall health of counties in every state across the country. For the first time, counties can get a snapshot of how healthy their residents are by comparing their overall health and the factors that influence their health, with other counties in their state. This will allow them to see county-to-county where they are doing well and where they need to improve. Everyone has a stake in community health. We all need to work together to find solutions. The *County Health Rankings* serve as both a call to action and a needed tool in this effort.

All of the *County Health Rankings* are based upon this model of population health improvement:
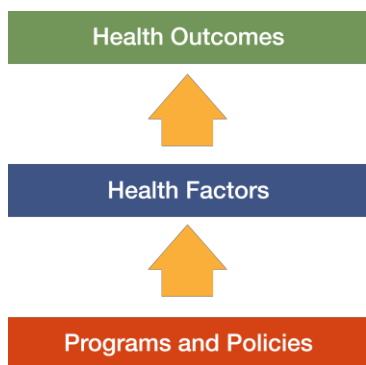
In this model, health outcomes are measures that describe the current health status of a county. These health outcomes are influenced by a set of health factors. These health factors and their outcomes may also be affected by community-based programs and policies designed to alter their distribution in the community. Counties can improve health outcomes by addressing all health factors with effective, evidence-based programs and policies.

Institute of Medicine, 2002

To compile the *Rankings*, we built on our prior work in Wisconsin, worked closely with staff from the Centers for Disease Control and Prevention and Dartmouth College, and obtained input from a team of expert advisors. Together we selected a number of population health measures based on scientific relevance, importance, and availability of data at the county level. For a more detailed explanation of the choice of measures, see www.countyhealthrankings.org.

The Rankings

This report ranks North Carolina counties according to their summary measures of **health outcomes** and **health factors**, as well as the components used to create each summary measure. The figure below depicts the structure of the *Rankings* model. Counties receive a rank for each population health component; those having high ranks (e.g., 1 or 2) are estimated to be the "healthiest."

Our summary **health outcomes** rankings are based on an equal weighting of mortality and morbidity measures. The summary **health factors** rankings are based on weighted scores of four types of factors: behavioral, clinical, social and economic, and environmental. The weights for the factors (shown in parentheses in the figure) are based upon a review of the literature and expert input but represent just one way of combining these factors.

| Health Outcomes | Mortality (length of life) 50% |
| | Morbidity (quality of life) 50% |

Health Factors	Health behaviors (30%)	Tobacco use
		Diet & exercise
		Alcohol use
		Unsafe sex
	Clinical care (20%)	Access to care
		Quality of care
	Social and economic factors (40%)	Education
		Employment
		Income
		Family & social support
		Community safety
	Physical environment (10%)	Environmental quality
		Built environment

Programs and Policies

County Health Rankings model ©2010 UWPHI

The maps on this page display North Carolina's counties divided into groups by health rank. The lighter colors indicate better performance in the respective summary rankings. The green map shows the distribution of summary health outcomes. The blue displays the distribution of the summary rank for health factors.

Maps help locate the healthiest and least healthy counties in the state. The health factors map appears similar to the health outcomes map, showing how health factors and health outcomes are closely related.

HEALTH OUTCOMES

Rank 1-25   Rank 26-50   Rank 51-75   Rank 76-100

HEALTH FACTORS

Rank 1-25   Rank 26-50   Rank 51-75   Rank 76-100
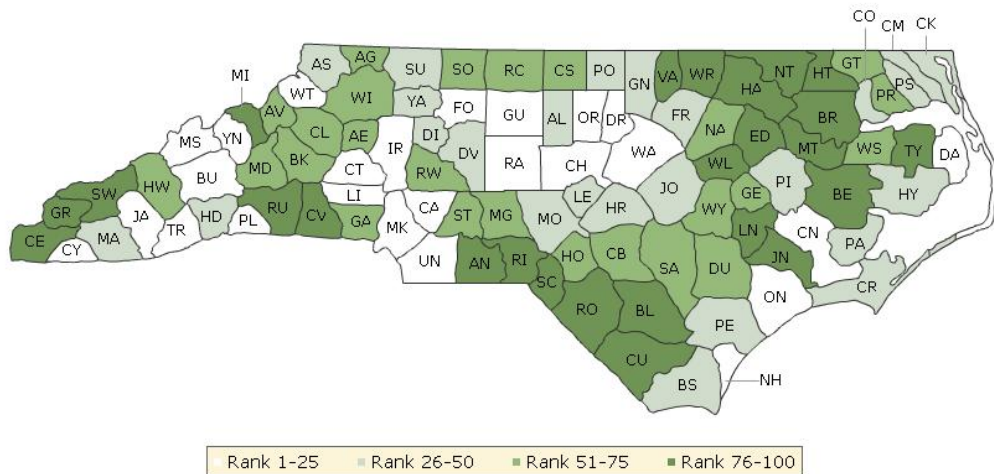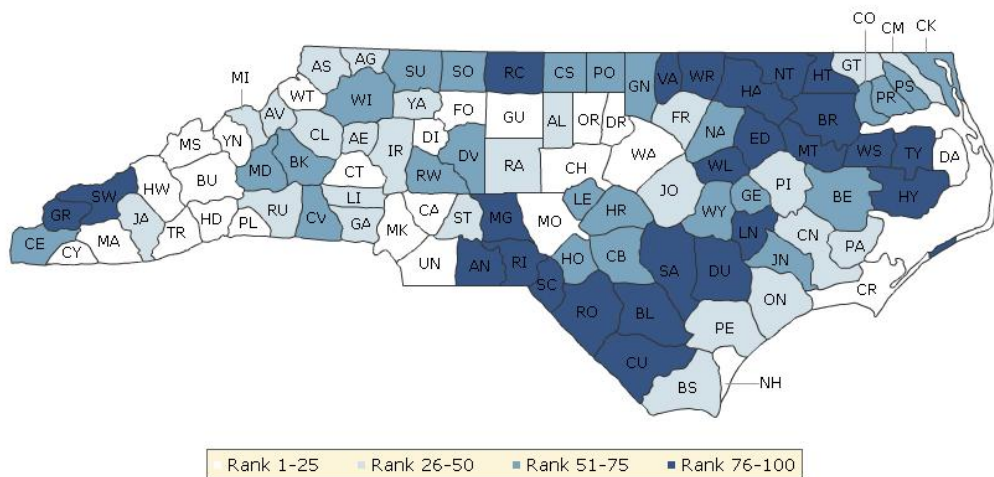
Summary Health Outcomes & Health Factors Rankings

Counties receive two summary ranks:
- Health Outcomes
- Health Factors

Each of these ranks represents a weighted summary of a number of measures.

Health outcomes represent how healthy a county is while health factors are what influences the health of the county.

Rank	Health Outcomes	Rank	Health Factors
1	Wake	1	Orange
2	Orange	2	Wake
3	Union	3	Buncombe
4	Chatham	4	Polk
5	Mecklenburg	5	Henderson
6	New Hanover	6	Transylvania
7	Dare	7	New Hanover
8	Watauga	8	Durham
9	Cabarrus	9	Moore
10	Guilford	10	Union
11	Durham	11	Chatham
12	Jackson	12	Catawba
13	Randolph	13	Yancey
14	Madison	14	Mecklenburg
15	Onslow	15	Macon
16	Yancey	16	Watauga
17	Transylvania	17	Guilford
18	Catawba	18	Madison
19	Clay	19	Haywood
20	Forsyth	20	Forsyth
21	Iredell	21	Clay
22	Lincoln	22	Cabarrus
23	Polk	23	Davie
24	Craven	24	Carteret
25	Buncombe	25	Dare
26	Alamance	26	Craven
27	Carteret	27	Mitchell
28	Pasquotank	28	Alamance
29	Ashe	29	Iredell
30	Camden	30	Yadkin
31	Moore	31	Jackson
32	Johnston	32	Brunswick
33	Henderson	33	Lincoln
34	Hyde	34	Alexander
35	Harnett	35	Pamlico
36	Franklin	36	Stanly
37	Davie	37	Ashe
38	Pender	38	Camden
39	Pamlico	39	Pitt
40	Currituck	40	Pender

Rank	Health Outcomes	Rank	Health Factors
41	Davidson	41	Randolph
42	Yadkin	42	Rutherford
43	Brunswick	43	Onslow
44	Macon	44	Franklin
45	Pitt	45	Caldwell
46	Lee	46	Avery
47	Person	47	Gates
48	Surry	48	Alleghany
49	Granville	49	Gaston
50	Chowan	50	Johnston
51	McDowell	51	Currituck
52	Avery	52	McDowell
53	Stokes	53	Stokes
54	Cumberland	54	Cumberland
55	Caswell	55	Cherokee
56	Haywood	56	Burke
57	Hoke	57	Wayne
58	Caldwell	58	Davidson
59	Montgomery	59	Lee
60	Alexander	60	Surry
61	Nash	61	Nash
62	Rowan	62	Wilkes
63	Wayne	63	Harnett
64	Wilkes	64	Rowan
65	Washington	65	Cleveland
66	Gates	66	Pasquotank
67	Sampson	67	Beaufort
68	Stanly	68	Jones
69	Greene	69	Chowan
70	Gaston	70	Granville
71	Rockingham	71	Caswell
72	Burke	72	Perquimans
73	Duplin	73	Greene
74	Alleghany	74	Person
75	Perquimans	75	Hoke
76	Graham	76	Wilson
77	Tyrrell	77	Bladen
78	Swain	78	Hertford
79	Cleveland	79	Montgomery
80	Beaufort	80	Washington
81	Wilson	81	Hyde
82	Jones	82	Sampson
83	Cherokee	83	Duplin
84	Mitchell	84	Lenoir
85	Rutherford	85	Rockingham
86	Scotland	86	Graham
87	Anson	87	Martin
88	Lenoir	88	Tyrrell
89	Northampton	89	Bertie
90	Richmond	90	Richmond

Rank	Health Outcomes	Rank	Health Factors
91	Vance	91	Swain
92	Warren	92	Anson
93	Hertford	93	Halifax
94	Edgecombe	94	Northampton
95	Martin	95	Scotland
96	Halifax	96	Vance
97	Bladen	97	Columbus
98	Robeson	98	Warren
99	Bertie	99	Edgecombe
100	Columbus	100	Robeson

Health Outcomes Rankings

The summary health outcomes ranking is based on measures of mortality and morbidity. Each county's ranks for mortality and morbidity are displayed here. The mortality rank, representing length of life, is based on a measure of premature death: the years of potential life lost prior to age 75.

The morbidity rank is based on measures that represent health-related quality of life and birth outcomes. We combine four morbidity measures: self-reported fair or poor health, poor physical health days, poor mental health days, and the percent of births with low birthweight.

Rank	Mortality	Morbidity
1	Wake	Wake
2	Orange	Chatham
3	Union	Polk
4	New Hanover	Orange
5	Mecklenburg	Union
6	Watauga	Jackson
7	Madison	Dare
8	Durham	Clay
9	Chatham	Mecklenburg
10	Camden	Moore
11	Guilford	Craven
12	Cabarrus	Cabarrus
13	Dare	Transylvania
14	Onslow	Guilford
15	Randolph	New Hanover
16	Davie	Lincoln
17	Pasquotank	Macon
18	Johnston	Carteret
19	Alamance	Yancey
20	Catawba	Randolph
21	Yancey	Onslow
22	Forsyth	Pamlico
23	Currituck	Catawba
24	Iredell	Iredell
25	Buncombe	Durham
26	Ashe	Forsyth
27	Jackson	Harnett
28	Transylvania	Watauga
29	McDowell	Lee
30	Lincoln	Buncombe
31	Hyde	Person
32	Henderson	Henderson
33	Pender	Nash
34	Clay	Brunswick
35	Franklin	Granville
36	Davidson	Swain
37	Craven	Yadkin
38	Caswell	Hyde
39	Carteret	Ashe
40	Surry	Franklin

Rank	Mortality	Morbidity
41	Stokes	Wayne
42	Rowan	Alamance
43	Harnett	Madison
44	Pitt	Montgomery
45	Gates	Pender
46	Yadkin	Sampson
47	Chowan	Pasquotank
48	Polk	Pitt
49	Alleghany	Hoke
50	Moore	Davidson
51	Tyrrell	Avery
52	Cumberland	Johnston
53	Wilkes	Cumberland
54	Brunswick	Greene
55	Avery	Haywood
56	Pamlico	Chowan
57	Caldwell	Alexander
58	Haywood	Gaston
59	Granville	Surry
60	Alexander	Caldwell
61	Person	Camden
62	Stanly	Cherokee
63	Burke	Washington
64	Lee	Davie
65	Washington	Currituck
66	Jones	Rockingham
67	Hoke	Duplin
68	Montgomery	Stokes
69	Macon	Stanly
70	Perquimans	Wilson
71	Rockingham	Rutherford
72	Duplin	Wilkes
73	Mitchell	Beaufort
74	Gaston	Caswell
75	Cleveland	Graham
76	Greene	Burke
77	Wayne	Anson
78	Graham	Perquimans
79	Nash	McDowell
80	Sampson	Gates
81	Beaufort	Martin
82	Lenoir	Rowan
83	Wilson	Scotland
84	Warren	Cleveland
85	Northampton	Alleghany
86	Cherokee	Edgecombe
87	Richmond	Robeson
88	Rutherford	Vance
89	Scotland	Mitchell
90	Hertford	Jones

Rank	Mortality	Morbidity
91	Swain	Tyrrell
92	Anson	Richmond
93	Vance	Northampton
94	Edgecombe	Hertford
95	Halifax	Bladen
96	Bladen	Columbus
97	Bertie	Halifax
98	Columbus	Lenoir
99	Robeson	Bertie
100	Martin	Warren

Health Factors Rankings

The summary health factors ranking is based on four factors: health behaviors, clinical care, social and economic, and physical environment factors. In turn, each of these factors is based on several measures. Health behaviors include measures of smoking, diet and exercise, alcohol use, and risky sex behavior. Clinical care includes measures of access to care and quality of care. Social and economic factors include measures of education, employment, income, family and social support, and community safety. The physical environment includes measures of environmental quality and the built environment.

Rank	Health Behaviors	Clinical Care	Social & Economic Factors	Physical Environment
1	Orange	Orange	Orange	Hoke
2	Yancey	Durham	Wake	Yadkin
3	Polk	Buncombe	Currituck	Madison
4	Mecklenburg	Transylvania	Transylvania	Clay
5	Wake	New Hanover	Union	Onslow
6	Buncombe	Pitt	Watauga	Halifax
7	New Hanover	Forsyth	Camden	Tyrrell
8	Henderson	Catawba	Chatham	Polk
9	Moore	Rutherford	Polk	Ashe
10	Clay	Henderson	Dare	Craven
11	Avery	Haywood	Henderson	Brunswick
12	Macon	Guilford	Buncombe	Moore
13	Watauga	Wake	Davie	Buncombe
14	Union	Macon	Carteret	Swain
15	Catawba	Mecklenburg	Cabarrus	Nash
16	Chatham	Moore	Haywood	Mitchell
17	Transylvania	Madison	New Hanover	Richmond
18	Forsyth	Cleveland	Madison	Jones
19	Durham	Cumberland	Jackson	Robeson
20	Guilford	Mitchell	Iredell	Rutherford
21	Mitchell	Chowan	Mecklenburg	Franklin
22	Cabarrus	Yancey	Yadkin	Montgomery
23	Gates	Bladen	Johnston	Chowan
24	Alleghany	Alamance	Durham	Dare
25	Ashe	Burke	Moore	Scotland
26	Lincoln	Nash	Onslow	Pasquotank
27	Alexander	Scotland	Guilford	Cleveland
28	Greene	Vance	Pamlico	Duplin
29	Cherokee	Cabarrus	Stokes	Bladen
30	Brunswick	Caldwell	Forsyth	Henderson
31	Rutherford	Pamlico	Craven	Cherokee
32	Stanly	Polk	Catawba	Orange
33	Carteret	Hertford	Macon	Randolph
34	Alamance	Craven	Pender	Davie
35	Haywood	Edgecombe	Lincoln	Jackson
36	Iredell	Gaston	Clay	Alexander
37	Davie	Wayne	Alamance	Surry
38	Graham	McDowell	Franklin	Vance
39	Jackson	Stanly	Stanly	Perquimans
40	Pitt	Randolph	Avery	Graham

Rank	Health Behaviors	Clinical Care	Social & Economic Factors	Physical Environment
41	Washington	Pasquotank	Brunswick	Alamance
42	Wilkes	Rowan	Alexander	Harnett
43	Pender	Wilson	Granville	Wayne
44	Craven	Lee	Rowan	Yancey
45	Caldwell	Union	Ashe	Sampson
46	Madison	Bertie	Gates	Washington
47	Randolph	Halifax	Randolph	Gaston
48	Dare	Chatham	Harnett	Rockingham
49	Surry	Beaufort	McDowell	Chatham
50	Yadkin	Caswell	Wayne	Carteret
51	Cleveland	Clay	Yancey	Macon
52	Camden	Brunswick	Davidson	Catawba
53	Lee	Lincoln	Hoke	Warren
54	McDowell	Alexander	Cumberland	Stokes
55	Davidson	Davie	Person	Hertford
56	Jones	Person	Gaston	Pamlico
57	Tyrrell	Columbus	Caldwell	Pender
58	Gaston	Surry	Alleghany	Johnston
59	Harnett	Iredell	Mitchell	Lenoir
60	Wilson	Cherokee	Burke	Anson
61	Duplin	Hoke	Beaufort	Lee
62	Franklin	Carteret	Caswell	Pitt
63	Chowan	Davidson	Wilkes	Caldwell
64	Bladen	Richmond	Perquimans	Bertie
65	Pamlico	Lenoir	Pitt	Edgecombe
66	Burke	Robeson	Lee	Durham
67	Johnston	Granville	Surry	Cumberland
68	Nash	Anson	Pasquotank	New Hanover
69	Hyde	Washington	Rockingham	Burke
70	Perquimans	Franklin	Duplin	Wilson
71	Rowan	Hyde	Cherokee	Alleghany
72	Montgomery	Northampton	Sampson	Haywood
73	Stokes	Ashe	Nash	Beaufort
74	Hertford	Graham	Greene	Wilkes
75	Halifax	Jones	Jones	Hyde
76	Lenoir	Wilkes	Rutherford	Union
77	Wayne	Onslow	Montgomery	Davidson
78	Cumberland	Montgomery	Martin	Guilford
79	Martin	Pender	Swain	Transylvania
80	Onslow	Stokes	Hyde	McDowell
81	Richmond	Warren	Lenoir	Camden
82	Beaufort	Alleghany	Hertford	Caswell
83	Pasquotank	Rockingham	Wilson	Northampton
84	Anson	Perquimans	Chowan	Iredell
85	Caswell	Watauga	Cleveland	Greene
86	Sampson	Jackson	Bladen	Avery
87	Person	Dare	Northampton	Stanly
88	Currituck	Tyrrell	Washington	Gates
89	Bertie	Yadkin	Bertie	Currituck
90	Granville	Gates	Anson	Watauga

Rank	Health Behaviors	Clinical Care	Social & Economic Factors	Physical Environment
91	Columbus	Sampson	Tyrrell	Person
92	Rockingham	Martin	Richmond	Lincoln
93	Warren	Swain	Warren	Martin
94	Scotland	Greene	Columbus	Columbus
95	Northampton	Harnett	Graham	Cabarrus
96	Vance	Johnston	Vance	Granville
97	Swain	Currituck	Scotland	Forsyth
98	Hoke	Camden	Halifax	Wake
99	Robeson	Avery	Edgecombe	Rowan
100	Edgecombe	Duplin	Robeson	Mecklenburg

2010 County Health Rankings: Measures, Data Sources, and Years of Data

	Measure	Data Source	Years of Data
HEALTH OUTCOMES			
Mortality	Premature death	National Center for Health Statistics	2004-2006
Morbidity	Poor or fair health	Behavioral Risk Factor Surveillance System	2002-2008
	Poor physical health days	Behavioral Risk Factor Surveillance System	2002-2008
	Poor mental health days	Behavioral Risk Factor Surveillance System	2002-2008
	Low birthweight	National Center for Health Statistics	2000-2006
HEALTH FACTORS			
HEALTH BEHAVIORS			
Tobacco	Adult smoking	Behavioral Risk Factor Surveillance System	2002-2008
Diet and Exercise	Adult obesity	National Center for Chronic Disease Prevention and Health Promotion	2006-2008
Alcohol Use	Binge drinking	Behavioral Risk Factor Surveillance System	2002-2008
	Motor vehicle crash death rate	National Center for Health Statistics	2000-2006
High Risk Sexual Behavior	Chlamydia rate	National Center for Health Statistics	2007
	Teen birth rate	National Center for Health Statistics	2000-2006
CLINICAL CARE			
Access to Care	Uninsured adults	Small Area Health Insurance Estimates, U.S. Census	2005
	Primary care provider rate	Health Resources & Services Administration	2006
Quality of Care	Preventable hospital stays	Medicare/Dartmouth Institute	2005-2006
	Diabetic screening	Medicare/Dartmouth Institute	2003-2006
	Hospice use	Medicare/Dartmouth Institute	2001-2005
SOCIOECONOMIC FACTORS			
Education	High school graduation	National Center for Education Statistics[1]	2005-2006
	College degrees	U.S. Census/American Community Survey	2000/2005-2007
Employment	Unemployment	Bureau of Labor Statistics	2008
Income	Children in poverty	Small Area Income and Poverty Estimates, U.S. Census	2007
	Income inequality	U.S. Census/American Community Survey[2]	2000/2005-2007
Family and Social Support	Inadequate social support	Behavioral Risk Factor Surveillance System	2005-2008
	Single-parent households	U.S. Census/American Community Survey	2000/2005-2007
Community Safety	Violent crime[3]	Uniform Crime Reporting, Federal Bureau of Investigation	2005-2007
PHYSICAL ENVIRONMENT			
Air Quality[4]	Air pollution-particulate matter days	U.S. Environmental Protection Agency / Centers for Disease Control and Prevention	2005
	Air pollution-ozone days	U.S. Environmental Protection Agency / Centers for Disease Control and Prevention	2005
Built Environment	Access to healthy foods	Census Zip Code Business Patterns	2006
	Liquor store density	Census County Business Patterns	2006

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[1] State data sources for KY, NH, NC, PA, SC, and UT (2007-2008).

[2] Income inequality estimates for 2000 were calculated by Mark L. Burkey, North Carolina Agricultural & Technical State University, www.ncat.edu/~burkeym/Gini.htm.

[3] Homicide rate (2000-2006) from National Center for Health Statistics for AK, AZ, AR, CO, CT, GA, ID, IN, IA, KS, KY, LA, MN, MS, MT, NE, NH, NM, NC, ND, OH, SD, UT, and WV. State data source for IL.

[4] Not available for AK and HI.

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