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Disentangling Individual and Community Effects on Environmentally Sensitive Behaviors

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DISENTANGLING INDIVIDUAL AND COMMUNITY EFFECTS ON ENVIRONMENTALLY SENSITIVE BEHAVIORS

by

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Under the Direction of Lesley W. Reid, PhD

ABSTRACT

A major criticism of the environmental behavior literature is the nearly exclusive focus on the role of attitudes and individual-level characteristics. Despite this concentration on individual-level causes, variation in environmental behavior remains. As individual behavior becomes an increasingly significant source of pollution, a better understanding of the influences individual behavior is critical to addressing environmental degradation. This research re-directs the focus on individual-level influences on environmental behaviors by building models examining the varying dimensions of environmental behaviors as influenced by community characteristics. This is accomplished by testing a series of hypotheses under the auspices of two theoretical frameworks: the neoclassical economic theory and a social contextual model of environmental actions. Using individual-level data from the 1993 and 2000 General Social Survey and MSA data from the U.S. Census and the Environmental Protection Agency, I estimate two-level hierarchical models for three environmentally sensitive behaviors (environmentally sensitive food consumption, environmentally sensitive automobile use, and environmental activism). Multi-level analyses yield models revealing significant associations between MSA measures and individual environmental behaviors. Objective environmental conditions, region of MSA and MSA education level are significantly associated with environmentally sensitive food consumption behaviors, environmentally sensitive automobile use, and environmental activism behaviors, though their influence assumes diverse forms. Among the community measures, MSA education level is the primary social process that produces change in all environmental behaviors. In each of the models, MSA education level exhibits effects on all three behavioral measures and significant cross-level effects on automobile use behaviors. Living in a well educated MSA, particularly in the West or Northeast suggests higher environmental participation. Region of MSA is also a characteristic that must be considered when evaluating environmental behaviors, particularly for those living in the West and Northeast. Theoretical conclusions suggest that individual environmental behavior decision making is not simply a market exchange, but social forces are at work in the individual decision-making process.

INDEX WORDS: Environment, Community, MSA, Behavior, Multi-level analysis, Hierarchical regression, Pesticide use, Air quality, Activism

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CHAPTER 1

INTRODUCTION AND PROBLEM STATEMENT

Problem Statement

Environmental problems linked to society's technological evolution and demographic changes, such as urban sprawl and air quality, have garnered increasing media coverage over the past 50 years. First emerging on the national agenda during the mid 20th century, high profile events such as the publication of *Silent Spring*, the contamination at Love Canal, and global warming have raised awareness of harm to the environment caused by humans. The result is persistent widespread concern regarding the risks of environmental deterioration and broad public support for addressing environmental issues (Axelrod and Lehman 1993; Uyeki and Holland 2000).

While support for environmental issues is high, our understanding of actions taken by a concerned and supportive public is limited. Most of what we know about environmental behaviors comes from the environmental psychology and environmental education literatures where personal philosophical values and emotional attachment have been linked to pro-environmental behavior within a reasoned action or psychoanalytic framework (Grob 1995; Kaiser et al. 1999; Kollmuss and Agyeman 2002; Wakefield et al. 2006). These approaches assume individuals make rational behavioral decisions based on thought and information readily available to them (Kaiser et al. 1999; Kollmuss and Agyeman 2002; Wakefield et al. 2006). Yet these studies are limited because they do not consider the broader social context within which social and institutional influences shape all aspects of life. Behavior is not an outcome of only individual-level factors, but is influenced by individual experiences and exposures within families, households, neighborhoods, environments, and societies.

Interest in contextual effects has been on the rise over the past decade in multiple disciplines. For example, Diez Roux (2003) speaks of a paradigm shift in health research away from a narrow focus on individual-level causes to an acknowledgement that multiple levels of social life impact health outcomes. Likewise, the criminology literature documents a transition in focus from individual attributes to an increasing interest in the role of neighborhood characteristics in rates of crime including intimate violence against women and adolescent violence (Benson et al. 2003; Elliott et al. 1996; Sampson et al. 2002). A parallel transition from an individual-level focus to a multi-level approach is a natural transition for the investigation of environmental behaviors within the social sciences due to its focus on the influence of factors external to the individual. Such a contextual approach does not deny the importance of individual-level attributes or the role of individual concerns that predominate in the explanation of environmental behavior. Nor does it present a competing explanation. Utilizing a multi-disciplinary, multi-level approach provides context to the investigation of environmental actions and acknowledges that lifestyle choices and individual behaviors occur within residential environments shaped by social and economic institutions and policies (Diez Roux 2003; Ellen et al. 2001).

Despite the increased attention afforded context in various research disciplines, investigation of contextual influences on environmental behaviors independent of individual level characteristics has been largely ignored in the environmental behavior arena (Olli et al. 2001; Poortinga et al. 2004; Ungar 1994). Yet, of the studies utilizing contextual variables, the results suggest that context may be the most important variable influencing environmental behavior (Blake 2001; Corraliza and Berenguer 2000; Ungar 1994; Wakefield et al. 2006). For instance, Derksen and Gartrell (1993) find that individuals expressing little concern about the environment exhibit high levels of recycling behavior when access to a structured, institutionalized recycling program is readily available. Attitudes "enhance the effect of context on recycling" but are not enough to "overcome the barrier presented by lack of access" (Derksen and Gartrell 1993: 439).

In an effort to address the deficiencies in the literature, my research offers a fresh approach to examining the influences on environmental behaviors. This study extends the work of the environmental education and social-psychological disciplines and brings context into the examination of environmentally sensitive behaviors. It is consistent with the work on the effect of context in public health, criminology, and other areas of social research. I associate three environmentally sensitive behaviors (environmentally sensitive food consumption, environmentally sensitive automobile use, and environmental activism) with community socio-demographic and environmental measures taking into account potentially confounding factors at multiple levels. Using individual-level data from the 1993 and 2000 General Social Survey and aggregate-level data from the U.S. Census and the Environmental Protection Agency, I estimate two-level hierarchical models for these environmentally sensitive behavior measures. Estimation of multi-level models allows an examination of the influence of community effects on environmental behaviors net of individual-level predictors. To that end, I have three primary aims for this study: 1) to place environmental behaviors within a social context, 2) to further understand what factors contribute to individual environmentally sensitive behaviors, and 3) to address the disjuncture between the function of individual characteristics and the role of community phenomena in the understanding of environmental behaviors.

This research addresses my objectives by bridging the separate approaches to studying environmentally sensitive actions into a single model that is framed within a sociological perspective. Such an approach assumes the more realistic view that individuals live, work, and play within a social context that functions to shape individual attitudes and actions. By examining the influence of the larger social context we can enhance our understanding of who exhibits environmentally sensitive behavior, why they partake in environmental actions, and how to address environmental problems through social change.

Theoretical Background

The education and psychology disciplines document the contribution of individual traits, attitudinal characteristics, and subjective evaluations of contextual attributes to environmentally sensitive behaviors. The product of these investigations is a significant body of research that is invaluable to any exploration of the social aspects of environmentally friendly actions. Nevertheless, variation in the explanation of environmental behavior remains when demographic characteristics, economic measures, and attitudes are used to predict environmental behavior. An improved understanding of individual environmentally sensitive behavior is vital because the behavior of private individuals is one of the primary sources of pollution and the largest source that remains relatively unregulated (Vandenbergh 2005). Community effects have been suggested as a potential explanation for environmental behavior that is not explained by individual-level variables (Blake 2001; Corraliza and Berenguer 2000; Poortinga et al. 2004). Community characteristics may exert positive or negative influences on an individual's environmental actions. Case in point is communities with poor levels of air quality, which may require limiting outdoor activities due to potentially negative health effects. Residents may react by taking no action and assume a sheltered lifestyle. On the other hand, residents may respond with a plethora of actions including limiting personal behaviors that contribute to air pollution such as restricting personal automobile usage or more extraverted actions such as canvassing for increased regulations or implementation of transportation taxes.

A single comprehensive theory addressing the mechanisms by which community context influences environmental behaviors has yet to be developed (Blake 2001; Stern 2000; Wakefield et al. 2006; Whitehead et al. 2005). Several theoretical models have been proposed but remain systematically untested (Guagnano 1995; Stern 2000). Most are based on social or economic theory. However, the proposed forces influencing individual behavior differ between these two rationales. Theoretical models using an economic framework focus on the role of personal incentives while models with a social foundation place the individual within a contextual framework and attribute individual behavior to, at least partially, institutional and governmental policy. For this research, I use two theoretical frameworks to investigate how individual and community characteristics influence individual environmentally sensitive behaviors. These theoretical rationales include neoclassical economic theory and Wakefield et al.'s (2006) model of environmental actions.

Neoclassical Economics Framework

Neoclassical economics is the primary school of thought in the field of economics and the most influential approach to managing economic activities in modern market systems (McConnell and Brue 2001; Whitehead et al. 2005). It focuses on how supply and demand determine prices, industrial production, income distributions, and allocation of resources. The theory posits that individuals act independently of the larger social context, including social interactions, public policies, altruism, and the larger culture within which an individual lives, to make rational decisions among various choices. The goal of their decision is to maximize utility or minimize costs in one's own self-interest (McConnell and Brue 2001; Whitehead et al. 2005).

The main assumption guiding neoclassical economic theory is that individual behavior is based on rational decisions that utilize an internal cost/benefit analysis. Individuals will choose the least costly action that gives them the largest benefit or reward. For environmental behaviors this means that individuals will weight the benefits of participating in an environmentally sensitive behavior against the costs of that behavior. If the benefits outweigh the costs of the action(s), then the individual will rationally and logically choose that behavior. The literature on recycling suggests the appropriateness of a neoclassical model in the explanation of environmentally sensitive behaviors (Axelrod and Lehman 1993; Derksen and Gartrell 1993; Hunter et al. 2004). Axelrod and Lehman (1993) and others show that participation in curbside recycling, one of the most convenient and least expensive environmental behaviors, can be successful in the absence of any commitment to environmental causes or even environmentally sensitive attitudes (Axelrod and Lehman 1993; Derksen and Gartrell 1993; Hunter et al. 2004; Kollmuss and Agyeman 2002). These findings are supported by Derksen and Gartrell (1993) and Hunter et al. (2004) who observe that cost and convenience are deciding factors in the performance of environmentally sensitive behaviors, with individuals more likely to engage in environmentally sensitive behaviors if they are incorporated into daily life. The probability of activity increases when the activity is inexpensive and requires little extra time and involvement (Derksen and Gartrell 1993; Hunter et al. 2004).

Further support for a neoclassical economics framework is found in marketing research, where studies find that consumers do not necessarily translate their attitudes toward the environment into environmentally conscious consumerism (Hume 1991; Mainieri et al 1997;

Mandese 1991). Hume (1991) found that 74 percent of consumers professed support for environmental protection and 75 percent reported they would buy green. However, consumers' self-reported actions indicate they are not necessarily willing to participate in environmental programs or to pay more for environmentally friendly products. Only 46 percent of consumers reported participating in recycling bottles and cans, 26 percent recycled newspapers, 14 percent purchased items manufactured from recycled products, and 16 percent regularly frequented or brought from environmentally-friendly companies (Hume 1991; Mainieri et al. 1997).

According to the neoclassical economic approach, individuals intentionally make environmentally negative choices in response to financial or convenience considerations or they may see their contribution to environmental degradation as so minuscule as to be non-consequential and thus will not choose to act in an environmentally sensitive manner (Kipperberg 2003; Whitehead et al. 2005). Individuals may be motivated to maximize their use of resources because the costs of environmental degradation are distributed among the entire population who has access to the resource, though not all will use the resource (Enger and Smith 1992; Harlan et al. 2009; Kipperberg 2003). Vandenbergh (p. 13, 2005) illustrates this tenet using the common activity of mowing the lawn. The act of using a lawn mower releases biochemical substances that contribute to high ozone levels. If all residents of a community avoid using a lawn mower on high ozone days, then all individuals in the community will benefit from this action by lower ozone levels. However, the contribution of avoiding using a lawn mower by any single individual will be negligible. If all other residents avoid mowing their lawns, then the one individual who does mow their lawn will receive the positive results of lower ozone levels plus a freshly cut lawn. On the other hand, if that individual does not mow their lawn, then the only benefit they will receive from this action will be lower ozone levels. Thus, the greater the number of individuals involved, the more miniscule the contribution of any single individual and the less incentive to choose the environmentally friendly behavior (Vandenbergh 2005).

The rational argument of neoclassical economics applies not only to individual behavior but also to those who regulate individual behavior. Until recently, environmental regulation has focused almost solely on the business and industrial sectors and individual behavior has been relatively untouched. Because of the success of environmental regulation on business and industry, the last 10 years have witnessed a shift in the major sources of pollution from industry and manufacturing to individual actions (Vandenbergh 2005). For example, in 1995 municipal solid waste incineration was the leading source of dioxin emissions into the air in the United States. In 2002/2004, the primary source of airborne dioxin was backyard burning of garbage (Vandenbergh 2005). Further, individual use of on- and off-road motor vehicles contributes more high priority toxins into the air than all industrial sources combined (Vandenbergh 2005).

One of the reasons for the observed shift in the proportional share of pollution is that policymakers have found regulating business and industry easier and more efficient than regulating individual behavior. This is because proposed regulations aimed at individual behaviors have been found to be very unpopular and have been relatively abandoned (Vandenbergh 2005). As in the case of individual behavior, attempts to regulate such individual behavior may not be implemented if the economic or social costs are too high or if the political cost to the regulator is not acceptable (Vandenbergh 2005). Vandenbergh (2005) uses automobile emissions regulations as an example. Significant policy and regulatory efforts have been applied to the automobile industry to increase gasoline mileage and reduce exhaust emissions. However, attempts to regulate individual use of the automobile have been primarily limited to public relations campaigns or coercion such as high occupancy vehicle (HOV) lanes.

Critics have listed a number of weaknesses in the neoclassical economic approach (Cahuc et al. 2008; van den Bergh 2003). One is the failure to acknowledge social and cultural influences on behavior. Individual interactions are considered as solely market exchanges with the only goal being a gain in resources. However, by isolating the individual from social interactions, neoclassical economics over simplifies economic interactions and the individual decision-making process (Cahuc et al. 2008; van den Bergh 2003).

A second drawback is that it does not take into account the influence of social norms. The emotional or social costs of not adhering to certain pro-environmental behavior (such as littering) may be too high for non-compliance. Society may implement sanctions on those who refuse to comply, which may result in high economic costs but even higher social costs (Vandenbergh 2005). In other words, the economic cost to the individual who does not comply may be greater than compliance but the social benefits of compliance may significantly outweigh the economic costs (Vandenbergh 2005). Thus, norms may provide the motivation to comply with environmentally friendly behavior at a higher economic cost to the individual (Vandenbergh 2005).

Taking the basic tenets of the classical economic theory into account, if the neoclassical economic theory is correct and individuals are not influenced by the larger social context, then community level characteristics should not be a significant factor in individual environmentally sensitive behaviors.

Social Context Framework

Challenging the economically based theory is Wakefield et al. (2006) who offers a theoretical framework that does not rely upon rational behavioral choices or maximization of utility, but places individuals within the larger social context and attributes environmental behavior to individual and community characteristics. Wakefield et al.'s (2006) multi-disciplinary approach to understanding environmental behaviors is a representation of the major pathways through which individual attributes and community characteristics influence the behavioral response of individual residents of a community (see Figure 1). Taking the form of a path model, along the top are four groups of, interdependent, exogenous groups of variables. These four groups, consisting of individual, exposure, social network and community characteristics, are pre-existing groups of variables that impact the endogenous variables of predisposition and capacity (Wakefield et al. 2006). Predisposition and capacity, in turn, directly impact the outcome variable, environmental action, which can take a plethora of forms including civic action, personal change, and co-operative activities (Wakefield et al. 2006). While the model represents predisposition and capacity as directly influencing environmental action, they also mediate the influence of the individual and the community-level exogenous variables. In turn, a reciprocal relationship suggests that environmental action influences the individual and the community within which the individual resides (Wakefield et al. 2006).

Individual Characteristics

The primary body of research on environmental behaviors has focused on the contribution of individual-level demographic, residential, and health characteristics. The literature has established a role for individual-level characteristics such as socio-economic status, education, and age in predicting environmentally sensitive behaviors (Hunter et al. 2004; Poortinga et al.

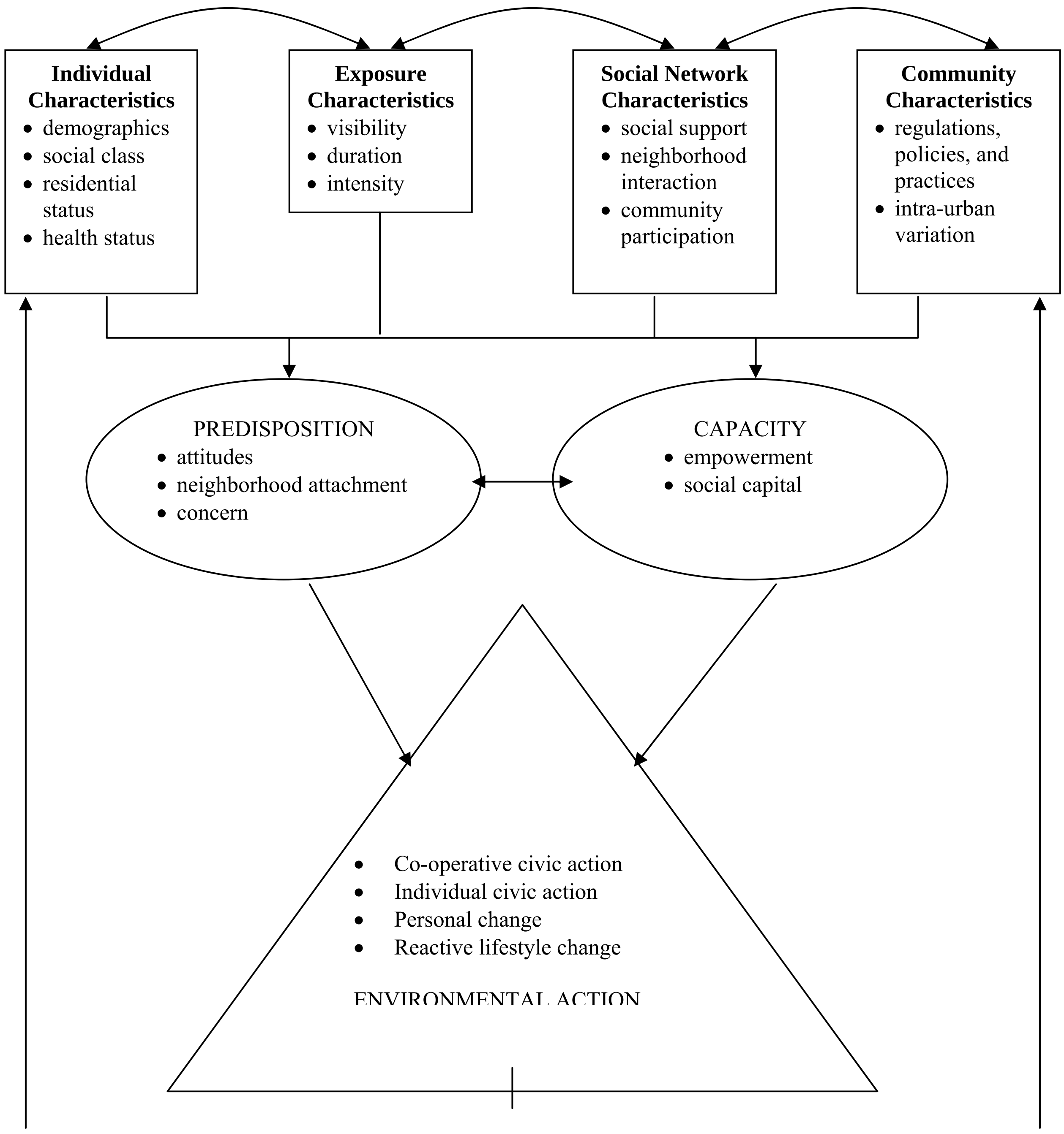

Figure 1: Conceptual Framework of Influences on Environmental Action (Wakefield et al. 2006)

2004; Uyeki and Holland 2000; Wakefield et al. 2006). Poortinga et al. (2004) and others find that socio-demographic characteristics play a strong role in environmental activities because they define individual opportunities and abilities to translate attitudes into action (Hunter et al. 2004; Wakefield et al. 2006). Age is extensively documented as positively related to environmental behavior with older individuals more environmentally active than younger individuals (Hunter et al. 2004; Stern 2000). Race is shown to be an important factor in environmental behaviors with minorities expressing higher environmental concern but lower environmental participation than non-minorities (Evans and Kantrowitz 2002; Jones and Rainey 2006; Stern 2000). However, it is the role of gender that has received the most attention in the demographic-environmental behaviors literature. Both men and women are observed to exhibit environmentally sensitive behaviors and both are more likely to act in an environmentally sensitive way on activities that present themselves as a part of everyday life (i.e., the private sphere). However, women exhibit more private environmentally sensitive behaviors such as purchasing organic foods when available and reducing automobile travel for environmental reasons (Blocker and Eckberg 1997; Davidson and Freudenburg 1996; Hunter et al. 2004; Mainieri et al. 1997; Tindall et al. 2003).

In addition to an individual's demographic profile, research suggests that those with a penchant toward environmentally sensitive behavior are the well educated and economically resourceful (de Oliver 1999; Hunter et al. 2004; Wakefield et al. 2006). It is observed that those with higher levels of education and higher levels of income tend to support environmental initiatives and are more environmentally active than those with less education and lower levels of income (Franzen 2003; Harlan et al. 2009; Kollmuss and Agyeman 2002; Poortinga et al. 2004; Wakefield et al. 2006).

An individual's place within the socioeconomic hierarchy influences belief orientations, type of neighborhood in which one lives, and social and economic relationships (Diez Roux et al. 2001; Sundquist et al. 2004; Uyeki and Holland 2000; Yen and Kaplan 1999). Research suggests that those holding conservative political beliefs and fundamental religious views tend to express less concern regarding environmental issues and tend to exhibit less environmentally friendly behavior than the politically liberal or individuals holding non-fundamentalist religious beliefs (Brehm and Eisenhauer 2006; Guth et al. 1995; Olli et al. 2001). Further, cultural membership or level of attachment to place of residence may influence understanding of local environmental issues or commitment to an environmentally friendly lifestyle (Johnson et al. 2004; Kaiser et al. 1999; Stedman 2003; Wakefield et al. 2006).

Exposure Characteristics

The first of three groups of exogenous community variables in Wakefield's et al. (2006) model is exposure characteristics (Wakefield et al. 2006). Objective environmental conditions provide individuals with a direct environmental experience that may impact their willingness to participate in behaviors that are environmentally sensitive. These variables determine an individual's experience with environmental conditions through the visibility, duration, and intensity of environmental pollution within individual residential, work, and recreational experiences (Blake 2001; Corraliza and Berenguer 2000; Olli et al. 2001; Wakefield et al. 2006). The level of pollution experienced by individuals varies by multiple factors including urban status, industrial composition, and neighborhood cohesiveness (Adeola 2000; Evans and Kantrowitz 2002). For example, research has observed significant variation in environmental burden and a lack of uniformity in the enforcement of environmental regulations along racial and socioeconomic lines (Adeola 2000; Evans and Kantrowitz 2002). The location of waste facilities, abandoned and derelict structures, and deserted factories are disproportionately located in low-income communities primarily occupied by minorities (Adeola 2000; Bullard 2000; Evans and Kantrowitz 2002).

Surprisingly very few studies have employed objective environmental conditions as a primary predictor of environmental behaviors. One of the rare studies that utilized objective environmental measures is Blake's (2001) study of context, perceived threat, and environmental behavior. Blake (2001) illustrates that as environmental problems vary by geographic area, the environmental behaviors expressed vary to reflect these geographic changes. The primary influences on attitudes towards environmental problems are not individual attributes such as gender and race, but objective contextual measures such as pollution levels and industrial composition (Blake 2001). Geographical variation in severity of environmental degradation is mirrored by geographical support for environmental protection with the highest levels of support found in areas facing the most severe environmental problems (Inglehart 1995).

In addition to influencing environmental behaviors directly, exposure characteristics may indirectly impact environmental behaviors by means of bolstering attitudes through personal experiences, or by contextual variables interacting with personal variables. A review of the literature identifies studies documenting a correlation between temperature, housing characteristics and energy consumption, between water rates and water usage, as well as between homeownership, size of household, and recycling behavior (Gamba and Oskamp 1994; Harlan et al. 2009; Kaiser et al. 1999; Mainieri et al. 1997; Moore et al. 1994; Olsen 1981; Verhallen and Van Raaij 1981). These studies propose that the broader context within which an individual lives, works, and plays is critical to understanding the larger picture of the individual's world and how that world affects environmentally sensitive behavior. Based on the accuracy of these studies and Wakefield's et al. (2006) model, objective environmental conditions should impact environmentally sensitive behaviors, net of individual and other community characteristics.

Social Network Characteristics

Wakefield's et al. (2006) conceptual model also identifies social network characteristics as contributing to environmentally sensitive behaviors. Social networking characteristics, such as community participation and neighborhood interaction, may influence the mindset of residents as well as provide opportunities for environmental actions and foster interests in environmental conditions (Paraskevopoulos et al. 2003; Parisi et al. 2004; Stedman 2002; Vorkinn and Riese 2001). The structure of relationships within a community mold individual experiences and provide a sense of place that help establish identity and provide a source of power to shape lifestyles (Ollie et al. 2001; Vorkinn and Riese 2001). Vorkinnn and Riese (2001) found that place attachment was the most important influence in explaining environmental concern. These results are supported by Stedman (2002) who found that place-protective behaviors are strongest in places that are central to individual identity. Personal network structures can impose restrictions thereby limiting options for environmental participation. On the other hand, personal network structures may also enable or empower individuals to act in environmentally sensitive ways (Stedman 2002; Tindall 2002). Olli et al. (2001) found that social participation in environmental networks was the single most significant influence on environmental behavior. These studies demonstrate that social networks are an important aspect of the larger social context within which individuals form attitudes and beliefs, and encourage environmentally friendly behavior.

Community Characteristics

Community characteristics such as local regulations, community services, and residential tenure establish individuals in local environments, influence the adequacy and quality of environmental community services, and contribute directly to the perception of risk. For example, a stable population may enhance a community's capacity to respond to perceived environment risks due to residents' investment in the community. A community's capacity to react is also tied to such factors as racial mix, level of urbanism, and the general hierarchy of needs (Abel and Stephan 2000; Derksen and Gartrell 1993; Evans and Kantrowitz 2002; Jones and Rainey 2006). This is illustrated by the environmental justice literature, which has found that urban minorities are concerned about their environment, but are not provided the same opportunities to exhibit environmentally protective behaviors due to economic issues and underdeveloped environmental infrastructure (Abel and Stephan 2000; Evans and Kantrowitz 2002; Jones and Rainey 2006).

As in the case of individual characteristics, age, race, and gender directly influence community socioeconomic context. In turn, community characteristics such as socioeconomic and educational levels influence the socioeconomic position of individual residents (Evans and Kantrowitz 2002; Israel et al. 2001; South and Crowder 1997). The economic resources of a neighborhood influence (either positively or negatively) educational attainment, employment prospects, and income potential of individuals in the neighborhood (Evans and Kantrowitz 2002; Israel et al. 2001; South and Crowder 1997). Such attributes may contribute to one's willingness and capability to behave in an environmentally protective manner (Abel and Stephan 2000).

Opportunities, ability, and interests that are important to acting in an environmentally sensitive manner may be influenced by the community in which an individual conducts their daily life (Parisi et al. 2004; Poortinga et al. 2004). Financial, emotional, political, and cultural investment in a community may influence the probability of participating in environmentally sensitive behaviors that enhance the quality of life of that community. For instance, a community composed of long-term residents may provide those residents with a stronger community-based support system that encourages political or community response to environmental threats to that community's quality of life (Wakefield et al. 2001). Further, the environmental characteristics and influences of a community-based support system found in heterogeneous communities may differ from those of a community based on a more homogeneous culture (Kaiser et al. 1999). The economic position of the community also may influence the individual's ability to participate in environmental behaviors. Areas of high poverty or disenfranchised populations may not be afforded the infrastructure or the opportunity to participate in community decision-making that promotes environmentally sensitive behaviors (Parisi et al. 2004). On the other hand, the infrastructure that promotes a cleaner environment, such as energy sharing programs or non-manufacturing industrial composition may be more readily available in urban areas (Parisi et al. 2004).

Consistent with the literature on community influence, community characteristics should play a significant role in explaining individual environmental behavior, net of individual level characteristics. Thus, if Wakefield's et al. (2006) representation is accurate, community characteristics will be identified as significant predictors of environmentally friendly behaviors.

Environmental Attitudes

Environmental attitudes are the most explored area in the search for predictors of environmental behavior. Wakefield's et al. (2006) model assumes that predisposition expressions are grounded in individual and community characteristics and individuals must have some level of knowledge and orientation to act in an environmentally sensitive manner (Blake 2001; Kaiser et al. 1999; Kaiser and Fuhrer 2003; Schultz et al. 2005; Schultz and Zelezny 1999; Stern and Dietz 1994; Stern et al. 1995; Wakefield et al. 2006). Several studies have investigated the link between knowledge of environmental problems, values, attitudes about the environment, and environmentally sensitive behaviors (Grob 1995; Poortinga et al. 2004). Kaiser and Fuhrer (2003) and Kaiser et al. (1999) find knowledge a necessary precursor to acting in an environmentally sensitive way, though it is not sufficient to explain environmental behavior. One must know there is a problem before one can act upon the problem.

Knowledge is a primary source for values. Schultz et al. (2005) and others find that an understanding of environmental issues as well as personal values are a foundation for concern regarding environmental issues and influence environmentally friendly behavior (Blake 2001; Kaiser et al. 1999; Kaiser and Fuhrer 2003; Schultz and Zelezny 1999; Stern and Dietz 1994; Stern et al. 1995). Those who maintain values consistent with environmentally related issues report higher levels of concern about environmental problems as well as higher levels of recycling, political activism, consumer behavior, and general willingness to assume environmentally sensitive actions (Mainieri et al. 1997; Poortinga et al. 2004; Schultz et al. 2005). However, the form of the knowledge-values-attitudes-behavior relationship appears to vary depending upon the value orientation of the individual (Schultz and Zelezny 2003; Schultz et al. 2005). As explained by Schultz and Zelezny (2003) those individuals holding self-transcendence values and life expectations (putting the interests of other living things before oneself) are more likely to express those values through environmentally sensitive actions. On the other hand, individuals maintaining self-enhancing values and life goals (focusing on one's own interests without considering the interests of other living things), a hallmark of American society, are less likely to be concerned about the environment and engage in environmentally sensitive behaviors (Schultz and Zelezny 2003, 1999; Stern et al. 1995).

While a significant relationship between environmental values and environmental attitudes is clearly documented, a corresponding relationship between environment attitudes and environmental behavior is not as obvious (Kaiser et al. 1999; Schultz et al. 2005; Ungar 1994). Research examining the correlation between environmental attitudes and environmental behaviors finds a modest, though inconsistent, relationship between attitudes on environmental issues and environmentally sensitive behaviors (Kaiser et al. 1999; Kollmuss and Agyeman 2002; Ungar 1994). In fact, a few studies have shown that environmental behaviors can take place in the presence of ambivalent attitudes towards the environment when the behaviors are easy and part of daily living (Derksen and Gartrell 1993; Schultz and Zelezny 2003).

Wakefield's et al. (2006) model suggests that predisposition and capacity function as mediators of the effects of individual and community attributes. For example, community characteristics, including crime rates and poverty level, may influence neighborhood interaction and attachment that can impact one's willingness to sacrifice time and/or money addressing environmental issues. The physical environment, which includes a variety of attributes such as forms of pollution and visibility of environmental conditions, may shape the context within which individuals make lifestyle choices (Corraliza and Berenguer 2000; Olli et al. 2001). For instance, air pollution may influence the decision to partake of physical activity outside of the home, which can result in consequences for individual health. The more likely scenario is that predisposition and capacity are both necessary but insufficient components of environmental action.

While research suggests that attitudes may not be the ultimate determinant of environmentally sensitive behavior, they may mold behavioral intentions thereby providing a basis for environmental action (Blake 2001; Corraliza and Berenguer 2000; Kollmuss and Agyeman 2002; Olli et al. 2001; Wakefield et al. 2006). An individual's viewpoint on environmental issues may be affected by personal experiences with the environment, community characteristics, or perceived risk to the health and well-being of oneself or one's family (Alexrod and Lehman 1993). They may modify attitudes and change the character and strength of the attitude-behavior relationship once objective environmental conditions are considered. Blake (2001) finds that local environmental issues, which are the basis of personal experiences and assessment of personal risk, are higher on the agenda of concern of residents than distant global environmental issues. Environmental behavior is influenced by these concerns but they also may be influenced by the context that contributes to these concerns. Individuals are more likely to reflect environmentally sensitive behavior if the issue is of personal importance and if the opportunity is afforded them (Alexrod and Lehman 1993). Diekmann and Preisendoerfer (1992, as presented by Kollmuss and Agyeman [2002]) also suggest that environmentally sensitive attitudes may pre-dispose individuals to supporting non-tangible environmental behaviors such as political initiatives or policy changes that may facilitate environmentally sensitive behaviors like higher fuel taxes, increases in green space, or a stronger regulated business environment (Kiekmann and Preisendoerfer 1992 as presented by Kollmuss and Agyeman 2002; Wakefield et al. 2006).

Based on the literature and the accuracy of Wakefield's model, environmental attitudes may play a mediating role in predicting environmentally sensitive behaviors. Thus, I test the hypothesis that environmental attitudes significantly influence individual environmental behaviors once the contributions of individual and community characteristics are taken into account.

Individual and Community Interaction

Context may also interact with individual characteristics to influence environmentally sensitive behavior. Due to the complexity of contextual variables, some individuals may be more dependent on residential influences while others are constrained by personal economics or deficiencies of residential opportunity (Kollmuss and Agyeman 2002; Poortinga et al. 2004). Poortinga et al. (2004) and others find that individual opportunities and abilities, as defined by one's personal environment such as residential and community influences, change the expression of environmental behavior (Blake 2001; Guagnano et al. 1995; Kollmuss and Agyeman 2002; Parisi et al. 2004; Poortinga et al. 2004; Wakefield et al. 2006). Likewise, both Corraliza and Berenguer (2000) and Guagnano (1995) illustrate that predicting environmentally sensitive behaviors is more dependent upon the interaction of personal and contextual measures than on either personal or contextual variables independently. Kollmuss and Agyeman (2002) go even farther stating that the single most significant influence on environmentally sensitive behavior is the synergistic effects of individual attributes, attitudinal traits, and soci-cultural characteristics.

Extrapolating on the potential interactive effects of individual and community measures, individual characteristics and community indicators could produce synergistic effects that significantly impact individual environmentally sensitive behaviors above and beyond the observed significant effects of individual and community characteristics. This is reflected in Wakefield's et al. (2006) model that places predisposition and capacity, as determined by exogenous factors, as the primary conduit for influencing environmental behaviors. Thus, if Wakefield's et al. (2006) model is correct, significant interactive effects of attitudes and community measures should be reflected in the estimated models, even in the presence of other theoretically significant measures.

Proposed Analyses

Despite the accumulating evidence of the importance of context to environmental behavior, almost no studies have attempted to disentangle individual-level and contextual influences on individual environmentally protective behaviors. The literature on the contribution of individual characteristics is invaluable to the study of environmental behavior. Yet research clearly illustrates that individual characteristics and attitudinal measures are not enough and that influences external to the individual are the next arena to be explore in understanding what prompts individuals to act in an environmentally sensitive manner. This study addresses this gap by approaching the study of environmental behaviors from a contextual perspective. Specifically, this study will help clarify the relationship between individual, social, and environmental context and environmentally sensitive behavior by testing the following hypotheses:

H_1: When controlling for theoretically significant individual level attributes, MSA characteristics predict the number of environmentally sensitive behaviors. Specifically:

a. The greater the proportion of MSA acres treated with pesticides, the more environmentally sensitive food consumption behaviors one will exhibit.
b. The greater the proportion of MSA days air quality is considered unhealthy, the more environmentally sensitive automobile use behaviors one will exhibit.
c. The greater the percentage of MSA days air quality is considered unhealthy, the more environmental activism behaviors one will exhibit.

d. Northeast and West MSAs will exhibit more environmentally sensitive behaviors than Southern MSAs.

e. The higher the percentage of the MSA population with a college degree, the more environmentally sensitive behaviors one will exhibit.

H_2: Attitudes about environmental issues significantly and positively influence the number of environmentally sensitive behaviors, net of the contributions of individual and MSA characteristics. Specifically:

a. The greater the concern about the effects of pesticides in food, the more environmentally sensitive food consumption behaviors one will exhibit.

b. The greater the concern regarding the effects of automobile use on air quality, the more environmentally sensitive automobile use behaviors one will exhibit.

c. Those in favor of environmental regulations will report more environmental activism behaviors.

H_3: Upon controlling for individual and aggregate level attributes, MSA characteristics moderate the effect of attitudes about environmental issues on environmentally sensitive behaviors. Specifically:

a. The proportion of MSA acres treated with pesticide moderates the relationship between attitudes about the effects of pesticides in food and the number of environmentally sensitive food consumption behaviors.

b. Northeast and Western MSAs moderate the relationship between attitudes about the effects of pesticides in food and the number of environmentally sensitive food consumption behaviors.

c. The percentage of the MSA population with a college degree moderates the relationship between attitudes about the effects of pesticides in food and the number of environmentally sensitive food consumption behaviors.

d. The proportion of MSA days air quality is considered unhealthy moderates the relationship between the concern regarding the effects of automobile use on air quality and the number of environmentally sensitive automobile use behaviors.

e. Northeast and Western MSAs moderate the relationship between the concern regarding the effects of automobile use on air quality and the number of environmentally sensitive automobile use behaviors.

f. The percentage of the MSA population with a college degree moderates the relationship between the concern regarding the effects of automobile use on air quality and the number of environmentally sensitive automobile use behaviors.

g. The proportion of MSA days air quality is considered unhealthy moderates the relationship between favoring environmental regulations and the number of environmental activism behaviors.

h. Northeast and Western MSAs moderate the relationship between favoring environmental regulations and the number of environmental activism behaviors.

i. The percentage of the MSA population with a college degree moderates the relationship between favoring environmental regulations and the number of environmental activism behaviors.

CHAPTER 2

DATA AND METHODOLOGY

The preceding chapters set the stage for the analysis of disentangling individual and community influence on environmentally sensitive behaviors. This task is undertaken utilizing variables linked to environmental behavior and considered of theoretical significance. In this chapter, I review the data and methods used in the analysis and address relevant data limitations, measurement difficulties, and methodological issues.

The Data Set

Data for this study are drawn from four primary sources including the General Social Survey (GSS), the Environmental Protection Agency (EPA), the U.S. Census of Agriculture, and the U.S. Decennial Census. Individual-level data is drawn from the General Social Survey (GSS) for 1993 and 2000. The GSS is a bi-annual nationally representative weighted sample of the adult population of the United States, conducted by the National Opinion Research Center (1999). This survey addresses such topics as socioeconomic status, social control, family, race, civil liberties, and morality (Davis et al. 2005). Designed as part of a program of social indicator research with topical modules on various emerging or expanding issues, the 1993 (N=1606) and 2000 (N=1541) GSS include an environmental module consisting of 60 items addressing attitudes and behaviors regarding environmental issues. This dataset composes one of the largest, and most reliable, sources of data on environmental behaviors and attitudes available and is attractive due to the expansive nature of the data collected. The response rate for the 1993 GSS was 82.4%, which is the highest rate recorded between 1975 and 2006 (GSS 2009). On the other hand, the response rate for the 2000 GSS is the lowest rate recorded during the same time span, 70.0% (GSS 2009). The latter can have consequences for generalizability of results and is taken into consideration in evaluating the results.

The GSS is a full probability sample of households in the United States, which ensures that each household has an equal probability of being included in the sample (GSS 2007). As a result, household-level measures are self-weighted (GSS 2007). However, the process of sampling for the individual to be interviewed within the household introduces a potential source of bias (GSS 2007). This is because individuals residing in smaller households have a greater probability of being selected while those residing in larger households have a lower probability of being selected (GSS 2007). As a result, individual-level variables are weighted in proportion to the number of individuals 18 years of age and older residing in the household (GSS 2007).

To facilitate my ability to describe the geographical areas of residence for each respondent and, in turn, control for the influence of those identified characteristics, I have obtained the GSS Primary Sampling Unit (PSU) codes from the National Opinion Research Center (NORC) (1999). PSU codes are codes identifying individual non-metropolitan counties or clusters of individual metropolitan counties as well non-metropolitan counties that are merged into adjacent counties (Davis et al. 2005; National Opinion Research Center 1999). The latter are also called Metropolitan Statistical Areas (MSAs), which are collections of counties with a central urban county tied together socially and economically. Single or multiple county metropolitan areas makeup approximately two-thirds of the PSUs while one-third is composed of non-metropolitan counties (Baumer et al. 2003). Individual level data from the GSS are merged with the GSS Primary Sampling Unit (PSU), which were provided by NORC in a separate dataset.

The GSS utilizes a complex sampling frame, details of which are explained in the GSS Codebook Appendices (Inter-University Consortium for Political and Social Research [ICPSR] 2004). For the purposes of this study, it should be noted that the 2000 GSS employed the 1990 sampling frame. The 1990 PSU codes provided by the National Opinion Research Center listed the individual counties within each MSA. These individual counties are used to obtain community and environmental data and to address discrepancies between the GSS and U.S.

Table 1: Discrepancies Between GSS and U.S. Census Bureau MSA Counties: 2000 and 1990 Data

MSA Name	Discrepancy	Solution
Boulder	The 1980 PSU list cites Denver-Boulder CO as PSU 355. The 1990 PSU list cites Denver CO MSA as 63 and Boulder, CO MSA as 65. Boulder CO MSA is not listed as a separate MSA on either the 1990 or 2000 Census. For both years Boulder is listed as part of the Denver-Boulder CO MSA.	Boulder County data is used for PSU 065 (Boulder MSA) and Denver-Boulder MSA data is used for PSU 063 (Denver CO MSA) and 355 (Denver-Boulder CO MSA).
Burke	The 1990 PSU list cites Burke Co ND as PSU 80 and the PSU consist of Burke and Ward Counties. Burke is not listed as a MSA for the 1990 or 2000 Census.	Data pulled for individual counties of Burke and Ward, combined, and entered for PSU #80.
El Dorado-Alpine	The 1980 PSU list cites El Dorado-Alpine CA as PSU 382 and consists of the two counties of El Dorado and Alpine. El Dorado-Alpine is not listed as a MSA on the 1990 Census web page.	Data were pulled for the individual counties of El Dorado and Alpine, California, combined, and entered for PSU 382.
Ft. Lauderdale	The 1980 PSU list does not identify Ft. Lauderdale as a MSA but does list Miami FL as MSA #340). The 1990 PSU list cites Ft. Lauderdale FL MSA as 48 and Miami FL MSA as 049. Both the 1990 and 2000 Census identifies Ft. Lauderdale as part of the Miami-Ft. Lauderdale MSA.	Broward County data (the only county listed as part of the Ft. Lauderdale MSA) is used for PSU 48 (Ft. Lauderdale FL MSA) and Miami-Ft Lauderdale FL MSA is used for PSU 49 (Miami FL MSA) and 340 (Miami FL MSA).
Tacoma	The 1990 PSU list cites Tacoma WA MSA as PSU 67 and consists of only Pierce County. The 1990 and 2000 Census identifies Tacoma as part of the Seattle-Tacoma MSA.	Pierce County data is used for PSU 67 and Seattle-Tacoma data is used for PSU 19 (Seattle MSA) and PSU 353 (Seattle WA MSA).

Census Bureau MSAs as listed in Table 1. The number of PSU codes for the 2000 data is 100. The 1993 GSS employed a split sampling frame, with half of the sample drawn from the 1990 sampling frame and half drawn from the 1980 sampling frame. This was done to measure the effect of changing from the 1980 to 1990 sampling frame (Inter-University Consortium for Political and Social Research 2004). The 1980 codes provided by the National Opinion Research Center did not list the individual counties within each MSA. This information was obtained from U.S. Census Bureau (U.S. Census Bureau 2008b) and used, along with the 1990 county-level information, to obtain community and environmental data and to address discrepancies between the GSS and Census MSAs as listed in Table 1. The number of PSU codes for the 1993 data is 91.

While I acknowledge the repeated cross-sectional characteristic of the GSS, data from the 1993 and 2000 GSS are not pooled. This is because some of the questions in the environmental modules for 1993 and 2000 surveys are not identical (e.g., income). For the sake of comparability, I treat the data as cross-sectional and analyze each time period separately.

Air quality data are available from the Environmental Protection Agency's Technology Transfer System Air Quality Network (also called AirData) web site starting in 1998 (U.S. Environmental Protection Agency 2008a). This data warehouse stores ambient air pollution data for 13 pollutants as collected from thousands of monitoring stations across the country and reported to the Air Quality System by EPA, state, local, and tribal air pollution control agencies (U.S. Environmental Protection Agency 2008a). Data were downloaded via the EPA's internet enabled information querying system (U.S. Environmental Protection Agency 2008a). I identified two potential problems associated with using these data for my analysis. The first is that the earliest date for which data are available is 1998. This poses a problem because some of my models use data collected in 1993. My solution is to use 1998 data for the 1993 analyses. Due to the limitations of using secondary data, many studies utilize data that were not collected during the same time period. For instance, my research is employing 1990 census data for the analysis of 1993 GSS data. While I acknowledge the use of 1998 data as a proxy for environmental conditions in 1993 does not adequately capture the environmental conditions experienced by the respondents at the time of the survey, the importance of the measure to the analysis warrants acceptance of this extrapolation. Thus, I utilize 1998 air quality data for estimating 1993 models. For estimation of the models for the year 2000, air quality data for the year 1999 is employed in the analysis. Using data from the year prior to the survey should facilitate capturing the effect of the respondents' previous year's experience with air quality.

The second problem I identified with the EPA data is the availability of air quality data for all counties. Air quality monitors that record daily concentrations of major pollutants are located at more than a thousand locations throughout metropolitan areas and in selected non-metropolitan areas (U.S. Environmental Protection Agency 2008a). Thus, not all counties have a monitoring station. For example, within the Atlanta 20 county MSA, only 14 counties have monitoring stations. Further, many non-metropolitan counties have no monitoring stations at all and, thus, data are not available for those counties. To address this issue, data are downloaded electronically from the AirData system by county onto an Excel spreadsheet. Then data for counties within each of the respective MSAs and for which measurements were available were added together to obtain a single summary measure for the entire MSA. Data for individual county PSUs were used where available. These data were then merged with the PSU codes.

Data on pesticide usage by county was obtained from the 1992 Census of Agriculture**.** Of the available data, the most applicable to my project focused on the number of county acres treated with sprays, dusts, granules, fumigants, etc. to control weeds/grass/brush in crops/pastures. Because data were not available electronically, data on the number of treated acres were downloaded from the Cornell University Library website in paper form (Cornell University 2008), entered onto an Excel spreadsheet by county, and averaged over the respective GSS PSU MSA and county codes. Data coded as D (data withheld to avoid disclosing data for individual farms) or N (not available) were coded as 0. Entries were not available on the Cornell University Library website for the counties/independent cities listed in Table 2. For these counties/independent cities, all data were coded as 0. It is acknowledged that this is equivalent to loss of data and can lead to a decrease in statistical power.

Table 2: Counties and Independent Cities for Which Percent of Acres is not available in the U.S. Agricultural Census

MSA	County/Independent City
Baltimore (017 and 314)	Baltimore City
Johnson City-Kingsport-Bristol (346)	Bristol City
Lynchburg (046)	Lynchburg City
Norfolk-Virginia Beach-Newport News (050)	Hampton City Newport News City Norfolk City Poquoson City Portsmouth City Williamsburg City
Richmond-Petersburg (047)	Colonial Heights City Hopewell City Petersburg City Richmond City
St. Louis (013 and 312)	St. Louis City
Washington DC (008 and 307)	Alexandra City District of Columbia Fairfax City Falls Church City Manassas Manassas City

Raw data for counties within each of the respective MSAs were added together to obtain a single number for the entire MSA. Then a percent or proportional summary measure was calculated for each MSA as explained in the variable section to follow. These data were then imported into SPSS and merged with the PSU codes.

The 1990 and 2000 U.S. Decennial Census are the primary sources for the community level socio-demographic variables. Census data were downloaded directly from the U.S. Census Bureau's American FactFinder web page into an Excel file (U.S. Census Bureau 2008a). For both years, data were pulled for the MSA and individual counties identified by the GSS PSU codes using the Summary Tape File 3 (STF3) Sample Data, Detailed Tables. This is because the variables required for the successful estimation of the 1990 models were only available electronically on the sample tables. To maintain consistency, the data used in estimating the 2000 models use data from the sample data tables. After the data were downloaded, they were imported into SPSS and merged with the PSU codes.

The first step in assembling the datasets was to merge 1993 and 2000 individual level data from the GSS separately with the GSS PSU obtained from the National Opinion Research Center to create two level one files. The second step involved merging the air quality, pesticide, and census data to be used in the 1993 and 2000 analyses with the GSS PSU codes to create two level two files. The result is four raw data files. Two files consist of individual-level data including one for the 1993 GSS and one for the 2000 GSS. Two files consist of MSA/county-level data including one containing data from the identified sources for the years 1990 to 1998 for the 1993 analysis and one containing data from the identified sources for 1999 and 2000 for the 2000 analysis. All recoding, variable creation, and initial variable review were completed using SPSS. Estimation of HLM models is undertaken by use of HLM Version 6.06.

The Variables

Dependent Measures of Environmental Action

The principal variables of interest are environmental behaviors. I use Axelrod and Lehman's (1993:153) definition of environmentally sensitive behaviors, which defines environmental behavior as action "that contributes toward environmental preservation and/or conservation." These variables are topical in that the measures address specific environmental issues including environmentally sensitive food consumption, environmentally sensitive automobile use and environmental activism (see Table 3). The decision to employ action-specific behaviors rather than more general environmental action measures is guided by the literature. Multiple studies have illustrated the necessity of differentiating environmental actions due to the potential varied determinants between collective action and individual action (Blake 2001; Hunter et al. 2004; Stern 2000).

A necessary goal of the present study is the development of individual-level measures of the underlying dimensions of environmentalism. To this end, I develop four separate environmental measures: environmentally sensitive food consumption (1993), environmentally sensitive automobile use (1993), and environmental activism (1993 and 2000 separately). Two measures of individual private actions are created using questions available from the 1993 GSS only. The first is an environmentally sensitive food consumption (ESFC) measure that utilizes the following question addressing the actions of purchasing and consuming food stuff:

- How often do you make a special effort to buy fruits and vegetables grown without pesticides or chemicals?

Table 3: Dependent Variables - GSS 1993 and 2000

Dependent Variables	Question(s)	Measurement
Environmentally Sensitive Food	How often do you make a special effort to buy fruits and vegetables	Always Often

Consumption (1993)	grown without pesticides or chemicals?	Sometimes Never Not available where I live Don't Know No answer
Environmentally Sensitive Automobile Use (1993)	How often do you cut back on driving a car for environmental reasons?	Always Often Sometimes Never Don't Know No answer
Environmental Activism (1993 and 2000)	1) Are you a member of any group whose main aim is to preserve or protect the environment? 2) In the last five years, have you signed a petition about an environmental issue? 3) In the last five years, have you given money to an environmental group? 4) In the last five years, have you taken part in a protest or demonstration about an environmental issue?	Yes No Yes No Yes No Yes No

The question is chosen due its availability and ability to tap the relevance of environmental and social issues among individual consumption behavior. Response categories for this question range from never (0) to always (3). A low score for a respondent indicates less environmentally sensitive food consumption behavior while a high score is indicative of more environmentally sensitive food consumption behavior.

The second measure of individual or private actions is the environmentally sensitive automobile use measure (ESAU). This measure, which is only available from the 1993 GSS, utilizes a single measure of transportation patterns:

- How often do you cut back on driving a car for environmental reasons?

This question was chosen because the combustion engine is one of the primary sources of air pollution and individuals are the single largest contributor to air toxic emissions (Vandenbergh 2005; U. S. Environmental Protection Agency 2007). While a multi-item measure would be preferable, additional questions regarding automobile use or air pollution were not available on the dataset. The response categories for this measure range from never (0) to always (3). A low score indicate less environmentally friendly automobile use while a high score is indicative of more environmentally friendly automobile use behavior.

In addition to the two measures of private environmental actions, a public environmental action measure, called environmental activism (EA), is developed using the following four questions addressing political and conservational behaviors for both 1993 and 2000 GSS, independently. Responses were elicited from identical questions in both years. Each question has a dichotomous response category of 'Yes' or 'No.'

- Are you a member of any group whose main aim is to preserve or protect the environment?
- In the last five years, have you signed a petition about an environmental issue?
- In the last five years, have you given money to an environmental group?
- In the last five years, have you taken part in a protest or demonstration about an environmental issue?

These questions tap an individual's commitment to environmental activism through personal investment of time and financial resources. All items are recoded as to directionality for negative (0) and positive (1) responses. Responses to the four questions are added into a single measure; one measure for the 1993 sample and one measure for the 2000 sample. Reliability for both measures are estimated by Kuder Richardson 20. For the 1993 dataset, Kuder Richardson 20 is estimated at 0.402 while it is estimated at 0.613 for the 2000 dataset. In response to the low reliability for the 1993 dataset, further variable development was conducted using two questions as the dependent variable (give money and sign petition). For the 2000 dataset, the Kuder-Richardson rose from 0.613 to 0.654. When the same process was repeated for the 1993 data, the Kuder-Richardson dropped from 0.402 to 0.217. In fact, for the 1993 dataset the Kuder-Richardson was lower than 0.402 for all different combinations of the four individual variables used to construct the original activism measure. It is possible that individuals may have been less aware of environmental issues in 1993 and, thus, provided inconsistent answers to the individual measures used to construct the latent variable. An increased awareness over the seven year period between 1993 and 2000 may be reflected in more consistent responses to the same individual questions in 2000, thereby producing a more stable latent measure for the 2000 dataset. Using information from the expanded variable development and acknowledging the low reliability for the 1993 dataset, I proceed with using the original activism measure as the dependent variable for both the 1993 and 2000 analyses. The sum of the responses represent the respondent's level of environmental activism with the higher the score the more civic environmental activism behavior exhibited.

Mediating Variables

Internal measures that address potential predisposition factors are measures of environmental attitudes. Three topical measures are identified that correspond to the dependent variables under investigation (see Table 4). Attitudes toward the use of pesticides and chemicals in the food production process that are utilized in the environmentally sensitive food consumption model also encompass two attitudinal variables from the 1993 survey only. The two questions that are utilized address opinions on the effects of pesticides on the environment and on the respondent and their family.

- Do you think that pesticides and chemicals used in farming are ….
- Do you think that pesticides and chemicals used in farming are ….

Responses range from extremely dangerous (5) to not dangerous at all (1). Both items are recoded as to directionality for negative and positive responses and to assist in interpretability. Scores are summed to provide a measure of concern and Cronbach's alpha is estimated at 0.910. Thus, upon recoding, the higher the score the greater the concern about the effects of pesticides in food.

The 1993 model examining environmental behaviors in response to environmentally sensitive automobile use issues encompasses three measures in the development of an attitudinal measure. Two questions address concerns about the effects of automobile-produced air pollution on the environment as well as on the respondent and their family.

- Do you think that air pollution caused by cars is ….
- Do you think that air pollution caused by cars is ….

Table 4: Environmental Attitude Variables - GSS 1993 and 2000

Attitude Variables	Question(s)	Measurement
Attitude Toward Pesticides/Chemicals in Food Production (for use in Environmentally Sensitive Food Consumption model - 1993)	1) Do you think that pesticides and chemicals used in farming are ….	• Extremely dangerous for the environment • Very dangerous • Somewhat dangerous • Not very dangerous

		• Not dangerous at all for the environment • Can't choose • No answer
	2) Do you think that pesticides and chemicals used in farming are ….	• Extremely dangerous for you and your family • Very dangerous • Somewhat dangerous • Not very dangerous • Not dangerous at all for you and your family • Can't choose • No answer
Attitudes Towards Automobile-Produced Air Pollution (for use in Environmentally Sensitive Automobile Use model - 1993)	1) Do you think that air pollution caused by cars is ….	• Extremely dangerous for the environment • Very dangerous • Somewhat dangerous • Not very dangerous • Not dangerous at all for the environment • Can't choose • No answer
	2) Do you think that air pollution caused by cars is ….	• Extremely dangerous for you and your family • Very dangerous • Somewhat dangerous • Not very dangerous • Not dangerous at all for you and your family • Can't choose • No answer

Table 4: Environmental Attitude Variables - GSS 1993 and 2000 (continued)

Attitude Variables	Question(s)	Measurement
Attitudes Towards Automobile-Produced Air Pollution (for use in Environmentally Sensitive Automobile Use model -	3) Cars are not an important cause of air pollution	• Definitely true • Probably true • Probably not true • Definitely not true

1993)	4) Within the next 10 years, how likely do you think it is that there will be a large increase in ill-health in American's cities as a result of air pollution caused by cars?	• Don't know • Certain to happen • Very likely to happen • Fairly likely to happen • Not very likely to happen • Not at all likely to happen • Can't choose • No answer
Attitudes Towards Environmental Regulations (for use in Environmental Activism models - 1993 and 2000)	Government should pass regulations that protects the environment	• People or Business should decide how to protect the environment • Government should implement regulations to protect the environment

Responses range from extremely dangerous (5) to not dangerous at all (1). One question speaks to the probability of an increase in illness caused by poor air quality in urban areas.

- Within the next 10 years, how likely do you think it is that there will be a large increase in ill-health in American's cities as a result of air pollution caused by cars?

The responses ranges from certain to happen (5) to not at all likely to happen (1). Items are recoded as to directionality for negative and positive responses and to assist in interpretability, responses are summed to provide a measure of concern regarding air pollution. Cronbach's alpha is estimated at 0.749. The higher the score the greater the concern regarding the effects of automobile use on air quality.

For use in the 1993 and 2000 models of environmental activism, a dichotomous variable is developed that addresses the opinion on the role of government in protecting the environment. This variable is developed using the following two questions from the GSS battery of attitudinal questions. Both questions are available for the 1993 and 2000 surveys

- Government should let ordinary people decide for themselves how to protect the environment, even if it means they don't always do the right thing, or government should pass laws to make ordinary people protect the environment, even if it interferes with people's right to make their own decisions.
    - ➢ People should decide
    - ➢ Government should decide
- Government should let businesses decide for themselves how to protect the environment, even if it means they don't always do the right thing, or government should pass laws to make businesses protect the environment, even if it interferes with business' right to make their own decisions.
    - ➢ Business should decide
    - ➢ Government should decide

Individuals responding 'Government should decide' to both questions were coded as '1' indicating the belief that government should implement regulations to protect the environment. All others were coded as '0' indicating people or business should decide how to protect the environment. Those coded as people or business should decide how to protect the environment (0) are identified as the reference category.

Community Characteristics

Community characteristics utilized in all analyses include percent of the MSA population with a college degree and region of MSA (see Table 5). The educational level of a community may play a role in knowledge and attitudes of environmental issues as well as predicting community engagement in social issues and civic cooperative behaviors. A community that places value on education may also value other achievable goals such as environmental quality (Owens and Videras 2006). Additionally, including a region measure in the analysis may address the geographical variation in environmental issues as well as differences in cultural traditions that influence environmental attitudes and lifestyles (Waldron-Moore 2004). MSAs and individual counties are classified as Northeast, Midwest, West, and South, as identified by the U. S. Census Bureau. Residence in the South serves as the reference category. As in the case of individual-level variables, all community variables are consistent across models and all continuous variables are centered at the grand mean.

Exposure Characteristics

The objective conditions to be employed in this study were chosen to correspond with the environmental behavior under investigation and for their visibility to the general public. Some argue that group-level environmental variables are "proxies for individual level exposure due to their individual-level analogues" (Diez Roux 2002 p. 590). However, in this study I am considering this environmental variable to be a community-level variable. This is because it is an aggregate measure that is experienced by all individuals within the same geographical area. While individual exposure will vary depending upon such factors as occupation, residential location, or outdoor activities, the potential for exposure is present for all residents of that physical area.

Table 5: Metropolitan Area-Level Variables - 1990 - 2000

Variable	Source
Environmentally Sensitive Food Consumption Exposure Characteristics Proportion of Total Acres Treated with Sprays, Dusts, Granules, Fumigants, etc. to Control Weeds, Grass, Brush	Agricultural Census – 1992

<u>Community Characteristics</u> % College Graduates Region of MSA North East Midwest West South*	 1990 & 2000 Census 1990 & 2000 Census
Environmentally Sensitive Automobile Use <u>Exposure Characteristics</u> Proportion of Days Air Quality Unhealthy <u>Community Characteristics</u> % College Graduates Region of MSA North East Midwest West South*	 EPA – 1998 and 1999 1990 & 2000 Census 1990 & 2000 Census
Environmental Activism <u>Exposure Characteristics</u> Proportion of Days Air Quality Unhealthy <u>Community Characteristics</u> % College Graduates Region of MSA North East Midwest West South*	 EPA – 1998 and 1999 1990 & 2000 Census 1990 & 2000 Census

*Reference Category

For the 1993 environmentally sensitive food consumption model, the role of a community-level measure of pesticide usage by acre is explored. Use of this variable is intended to provide a measure of potential familiarity with the use of pesticide in food production, which may influence food consumption choices. The variable developed is the proportion of MSA/county acres treated with sprays, dusts, granules, fumigants, etc. to control weeds, grass, and brush. This variable is computed by dividing the number of MSA/county acres treated for weeds, grass, and brush by the total number of MSA/county acres.

For the 1993 environmentally sensitive automobile use model and the 1993 and 2000 environmental activism models, a measure of general air quality is employed. The objective environmental condition to be employed in these models is chosen due to its influence on multiple facets of daily life and for it's visibility to the general public. I explore the role of air quality using a measure of the proportion of days where air quality is classified as unhealthy. The EPA categorizes air quality into six categories with corresponding levels of health concern: good, moderate, unhealthy for sensitive groups, unhealthy, very unhealthy, and hazardous (U.S. Environmental Protection Agency 2008b). This study uses the proportion of days where the air quality was measured as unhealthy for sensitive groups, unhealthy, very unhealthy, and hazardous.

Individual Characteristics

Individual-level demographic measures employed in the analysis for all models include age, gender, and race (see Table 6). While age is operationalized as a continuous variable, gender is measured as a dichotomous variable with men serving as the reference group. A measure of race is available as a three category variable; White, Black, and Other. Due to the limited population of respondents identified as 'other,' the categories of Black and Other are combined into a Non-white category. For this study, the White population is used as the reference group.

Table 6: Individual-Level Variables - GSS 1993 and 2000

Variable	Measurement*
Age	Years
Gender	Male* Female
Race	White*

	Non-white
Education	Years
Total Family Income Before Taxes (recoded to midpoint and divided by 10,000)	$1,000 to 2,999 $3,000 to 3,999 $4,000 to 4,999 $5,000 to 5,999 $6,000 to 6,999 $7,000 to 7,999 $8,000 to 9,999 $10,000 to 14,999 $15,000 to 19,999 $20,000 to 24,999 $25,000 or over
Religiosity (How often to you attend religious services)	Religiously Inactive* Moderately Religious Religiously Active
Political Ideology	Liberal Moderate Conservative*
Health Status	Excellent/Good Fair/Poor*
Urban Residential Status	Urban* Suburban Rural
Mediating Variable Environmental Attitude	Composite variable – see Proposed Environmental Attitudes Variables

*Reference category

Measures of socioeconomic status consist of years of education and family income. Education is operationalized as the number of years of education completed by the respondent. On the original survey, total family income before taxes is classified into 21 groups in 1993 and 23 groups in 2000. In order to utilize income as a continuous variable, I recode each category to its midpoint and divide by a constant of 10,000. The latter is done to assist with interpretation.

Other variables in all models include measures of religiosity and political ideology and health status. Religiosity is operationalized using a measure of attendance at religious services ranging from never (0) to several times a week (9). This measure is collapsed into a variable with church attendance several times a year or less categorized as 'religiously inactive;' one to three times a month identified as 'moderately religious,' and 'religiously active' identified as someone who attends church nearly every week or more. The religiously inactive serve as the reference group. Political ideology is operationalized as a self-identified seven category variable ranging from extremely liberal to extremely conservative. To assist in interpretation, I collapse the seven categories into the three groups of liberal, moderate, and conservative. Those expressing conservative political beliefs serve as the reference group. Health is originally measured in four categories of excellent, good, fair, and poor. These categories are folded into a dichotomous variable of excellent to good (1) and fair to poor (0) with the latter, fair to poor, identified as the reference group.

A measure of urban residential status is also included in this study. For urban residential status, data are categorized according to gross population as collected by the U.S. Census Bureau. For this study, the six categories available in the dataset are collapsed into three groups representing urban, suburban, and rural areas. Those living in urban areas are identified as the reference category.

All continuous predictor variables are centered at the grand mean. This is done by subtracting each respondent's value on each independent variable from the mean of that variable across the mean of all respondents in the entire sample. By centering, the meaning of the predictor variable(s) is restrained to the mean of the study sample. In other words, the model intercept represents the environmentally sensitive result of a respondent whose score or value on the independent variable is the same as the grand mean (Koenig and Lissitz 2001). This facilitates the interpretation of results and allows me to examine mean differences on environmentally sensitive behaviors as a function of the selected independent variables. It also reduces the possibility of multi-collinearity between the intercept and slope estimates across the groups, in this case MSAs (Koenig and Lissitz 2001).

Missing Data

1993 Data

A challenge identified during the consolidation of the datasets is missing data at both the aggregate and individual level for both the 1993 and 2000 datasets. For the 1993 individual level dataset, data are missing on both the dependent and independent variables. Three hundred and thirty nine (339 or 21.1%) of the cases are missing data for at least one of the three dependent variables. These missing data are distributed as follows:

- Environmentally Sensitive Food Consumption = 202 (12.6%)
- Environmentally Sensitive Automobile Use = 89 (5.5%)
- Environmental Activism = 227 (14.1%)

To understand how cases missing data on at least one dependent variable differ from cases with no missing data on the dependent variables, I examined differences between the

Table 7: Individual-level Socio-economic and Socio-demographic Differences between Cases Missing on at Least One Dependent Variable - 1993

Individual-Level Independent Variable	Cases Missing One or More Dependent Variables N=339	Cases Not Missing Data on Dependent Variables N=1,267
Mean Age**	51.6	44.6
Gender (%Females)	58.1	57.1
Mean Family Income**	$32,151.93	$36,602.33
Race		
White	81.1%	84.6%
Non-White	18.9%	15.4%

Health**		
Poor	10.7%	5.1%
Fair	24.4%	14.5%
Good	40.4%	46.8%
Excellent	24.4%	33.6%
Highest Year of School Completed**	12.5	13.2
Political Philosophy		
Conservative	36.3%	36.1%
Moderate	35.4%	37.6%
Liberal	28.3%	26.3%
Religiosity		
Inactive	47.4%	49.1%
Moderately Active	14.9%	16.1%
Active	37.7%	34.8%
Urban Status**		
Urban	22.4%	21.4%
Suburban	61.4%	68.5%
Rural	16.2%	10.1%

*p<0.05
**p<0.01

groups on the independent variables to be used in the analysis. Those missing data on any one of the dependent variables are significantly older, more rural, of poorer health, and report lower levels of income and education (see Table 7). Cases that are missing any one of the three dependent variables are deleted from all analyses. The individual sample size is reduced to 1,267.

Table 8: Individual-level Independent Variables with Missing Cases-1993

Individual-Level Independent Variable	Number of Cases With Missing Data N=827
Age	4
Attitude-Activism	25
Attitude-Air Pollution	115
Attitude-Pesticide in Food	16
Family Income	92
Health	705
Highest Year of School Completed	1
Political Philosophy	33
Religiosity	28

Of the 1,267 analytic cases with valid dependent variables, 827 (65.3%) cases are missing data on at least one independent variable. The variable driving this missing pattern is the measure of respondent health, which is missing on two-third of all cases. The high percentage of missing data on this variable is not the result of non-response but by GSS design; only one-third of GSS respondents are questioned about their health on a scheduled basis. Thus, these data are missing at random (Allison 2002). The distribution of missing cases by variable is noted in Table 8.

For the 1993 aggregate level dataset, data are missing for the air quality measures. All missing data are for single county PSUs, which are overwhelmingly rural (an average percent urban of 2.3% versus an average percent urban of 74.3% for PSUs without missing data on air quality). Air quality data are missing for 23 (19.8%) PSUs. Missingness for the air quality data is the result of the location of air quality monitors. While monitors are positioned at multiple locations throughout the United States, the majority of air quality monitors are found in the urban and suburban counties comprising MSAs. The majority of single counties identified as rural do not have air quality monitors. On the surface it appears these data are not missing at random. However, I am able to account for the cause of missingness and to control for the factors contributing to the missingness (urban status), these data can be considered as not missing at random but ignorable. This enables imputation of the missing values to proceed (Allison 2002; Wayman 2003).

As with the individual level cases, I examine the differences between PSUs missing air quality measures and those with analytic data. PSUs with missing air quality data report significantly lower levels college graduates (11.8% compared to 20.2% for PSUs with complete data) and tend to be located in the South (47.8%) and Midwest (34.8.6%) compared to the Northeast (13.0%) or West (4.4%).

Even though the 1993 GSS data had one of the highest response rates of all GSS surveys, the necessity of deleting 21.1% of the cases for this analysis affects the results. Deleting cases is data that are lost and, as described above, cases with missing data in this analysis are different from cases without missing data. This may result in incorrect standard errors and decreased statistical power. This, coupled with the disproportionate distribution of air quality measures, changes the face of the sample. The sample is representative of a more urban, younger, and educated population living in Western and Northeastern MSAs. Ultimately, these issues affect the ability to generalize to the larger population.

<u>2000 Data</u>

For the 2000 dataset, there are no missing cases on the dependent variable. The analytic dataset consists of 1,152 cases. Of the 1,152 cases, 250 (21.7%) cases are missing individual-level data on at least one independent variable. The distribution of missing cases by independent variable is found in Table 9. These data are considered as missing at random (Allison 2002; Wayman 2003).

Table 9: Individual-level Independent Variables with Missing Cases-2000

Individual-Level Independent Variable	**Number of Cases With Missing Data N=250**
Age	1
Attitude-Activism	65
Family Income	129
Health	4
Highest Year of School Completed	1
Political Philosophy	62
Religiosity	21

As with the 1993 aggregate dataset, select PSUs in the 2000 aggregate level dataset are missing data for the air quality measures. Air quality data are missing for 19 (19.0%) PSUs , all of which are single, rural counties (an average percent urban of 40.3% for PSUs missing air quality data versus a mean percent urban of 80.0% for PSUs not missing air quality data). Those PSUs with complete data report significant more (22.4%) college graduates than those with missing air quality data (14.2%). Further, 42.1% of those PSUs with missing data are located in the South while 31.6% are in the Midwest, 21.0% are located in the Northeast, and 5.3% are in the Northeast. The 2000 sample used in this analysis also appears to be a more educated population and more likely to live in Western and Northeastern MSAs. As in the case of the 1993 aggregate data, these data are not missing at random but ignorable (Allison 2002; Wayman 2003).

The most appropriate response to the documented missingness is to impute the missing values for both aggregate and individual-level cases. Imputation is the process of substituting an estimated value for a missing data point. This is done by predicting the missing data point using information from complete records in the dataset (Alison 2002; Bryk and Raudenbush 1992; Wayman 2003). For my research, this task was accomplished using SAS to create five (5) imputed aggregate and individual-level data sets for both 1993 and 2000. Because I imputed missing data, this affects the analysis process, which is explained below.

The Analytical Technique

The initial analytical function is to describe and become familiar with the samples that are the subject of the study. Following are descriptive statistics for the 1993 and 2000 samples.

<u>Sample Descriptive Characteristics for the 1993 Analyses</u>

Table 10 presents the descriptive characteristics statistics for both the dependent and independent variables. The primary variables of interest, the dependent variables measuring environmental behaviors, are shown at the top of the table. For each of the variables, responses indicate a sample that tends toward the non-environmentally friend behaviors. In the case of environmentally sensitive food consumption, which ranges from never (0) to always (3), respondents reported an average score of 1.00, or sometimes purchasing pesticide-free foods. The same pattern is observed for environmentally friendly automobile use where respondents indicated an average of 0.48 out of a range of 0 (never) to 3 (always), indicating that individuals never to sometimes reduce driving for environmental reasons. For environmental activism, the sample averages 1.1 environmental activities out of a possible 4 activities.

Preliminary examination of independent variables employed in the level one analysis is following the dependent variable descriptive statistics in Table 10. The sample is primarily composed of middle-aged (mean age of 44.6), whites (84.6%) with an average of 13.4 years of education. Over half the sample lives in the suburbs (68.5%) while nearly a quarter live in urban areas (21.4%) followed by rural residents (10.1%). Additional statistics show that women make up over half the sample (57.1%). Slightly more respondents identify themselves as politically

Table 10: Descriptive Statistics for the Dependent and Independent Variables - 1993

Dependent Variables	
Environmentally Conscious Food Consumption (mean)	1.00
Drive Less for Environmental Reasons (mean)	0.48
Environmental Activism (mean)	1.14
Level 1 Independent Variables (N=1267)	
Attitudes	
Attitude Toward Air Quality (mean)	13.2
Attitude Toward Chemicals (mean)	6.6
Attitude-%supporting government making laws	61.3
Demographic Characteristics	
Age (mean)	44.6
Female (%)	57.1
Non-White (%)	15.4

Socioeconomic Characteristics	
Education (mean years)	13.2
Household Income (mean)	36553.35
Residential	
Urban	21.4
Suburban	68.5
Rural	10.1
Health	
Health – Good/Excellent (%)	79.3
Political & Religious Beliefs	
Politically Conservative	36.2
Politically Moderate	37.8
Politically Liberal	26.0
Religiously Active	34.7
Religiously Moderate	16.1
Religiously Inactive	49.2
Level 2 Independent Variables (N=91)	
Environment	
%Acres Treated With Pesticides for Weeds (mean)	10.0
%Days Air Quality Unhealthy (mean)	7.0
Geographic	
Northeast MSA	20.2
Midwest MSA	23.7
West MSA	18.4
South MSA	37.7
Socioeconomic Characteristics	
%College Graduates (mean)	17.7

moderate (37.8%) while nearly half are religiously inactive (49.2%) indicating church attendance several times a year or less. An overwhelming majority reported their health to be good or excellent (79.3%). In contrast to environmentally sensitive behaviors, respondents tended to express concern about environmental problems. When questioned about their concern regarding the use of pesticides in farming, respondents reported an average of 6.6 out of a range of 0 (not at all dangerous) to 10 (extremely dangerous). Similar results are observed when questioned about effects of automobile-produced air pollution on the environment as well as on the respondent and their family; respondents reported an average score of 13.2 out of a possible total of 19.

Attitudes relating to environmental activism indicates 61.3%of the respondents questioned supported governmental environmental reforms.

At the community level, all regions of the country are represented with slightly more respondents living in the South (37.7%) followed by the Midwest (23.7%), Northeast (20.2%), and West (18.4%). Among the MSAs represented in the sample, approximately 17.7% of the population holds a college degree. The environmental measures of the represented MSAs show an average of 7.0% of days where air quality is considered unhealthy. Further, an average of 10.0% of the acres within the sampled MSAs is treated with pesticides for weeds.

Sample Descriptive Characteristics for the 2000 Analysis

Descriptive statistics for the 2000 sample are found in Table 11. The sole dependent variable for this sample measures environmental activism. Out of a possible four, respondents on average participated in 0.54 environmentally activities. Additional descriptives for level one independent variables show the sample is primarily composed of middle-aged (mean age of 45.5 years), whites (78.6%) with an average of 13.3 years of education score of 43.9. Women compose more than half of the sample (56.1%). The majority of the sample lives in the suburbs

Table 11: Descriptive Statistics for the Dependent and Independent Variables - 2000

Dependent Variable	
Environmental Activism	0.54
Level 1 Independent Variables (N=1152)	
Attitudes	
Attitude-%supporting govt making laws	43.8
Demographic Characteristics	
Age (mean)	45.5
Female (%)	56.1
Non-White (%)	21.4
Socioeconomic Characteristics	
Education (mean years)	13.3
Household Income (mean)	42128.84
Residential	
Urban	24.6
Suburban	64.8

Rural	10..6
Health	
Health – Good/Excellent (%)	78.4
Political & Religious Beliefs	
Politically Conservative	34.0
Politically Moderate	40.3
Politically Liberal	25.7
Religiously Active	28.8
Religiously Moderate	16.3
Religiously Inactive	54.9
Level 2 Independent Variables (N=100)	
Environment	
AQ unhealthy Days	6.2
Geographic	
Northeast MSA	16.0
Midwest MSA	26.0
West MSA	18.0
South MSA	40.0
Socioeconomic Characteristics	
%College Graduates	20.9

(64.8%) and over three-fourths reported their health to be good or excellent. More respondents identified themselves as politically moderate (40.3%) followed by politically conservative (34.0%) and politically liberal (25.6%) while over half the sample are religious inactive (54.9%) based on their self-reported church attendance. In terms of environmental attitudes, 43.8% of the respondents expressed support for governmental laws and reforms efforts to address environmental problems.

Descriptive statistics for the MSAs represented in the sample finds that more respondents live in the South (40.0%) than in the Midwest (26.0%), West (18.0), or Northeast (16.0%), and slightly over one fifth of the population are college graduates. The environmental measures of the represented MSAs show that air quality is considered unhealthy an average of 6.2 days a year.

Multi-level Analysis

The goal of this research is the development of models examining the role of individual and community influences in environmental behaviors. The nature of this analysis is essentially hierarchical, with individuals being nested within communities that are affected by the same community influences and environmental exposures. Therefore a hierarchical multi-level analytical approach is undertaken. Multi-level analysis is an analytical technique employed to investigate the effects of group-level characteristics and experiences on individual-level attributes (Bryk and Raudenbush 1992; Diez Roux 2002; Raudenbush and Bryk 2002). It builds on the knowledge gained from individual level analysis by acknowledging the power of the collective to mold the attitudes and behaviors of individuals. Multi-level analysis, as used in this study, involves estimating equations at two levels. The first level is the individual-level equations that will explain individual-level variation within each MSA. The second level is aggregate-level equations that will explain aggregate-level variation across MSAs (Diez Roux 2000).

Prior to initiating the analysis, a clarification on the definition of community as used in this research is warranted. Wakefield et al. (2006) uses community to identify groups of diverse individuals who share common social, cultural, and civic characteristics based on a shared geographical location. My use of the term community differs from Wakefield et al.'s (2006) in that it is used, not to identify a group of individuals, but to reference the community of MSAs.

I am estimating random intercept models. This type of model fits a regression line to the data for each MSA but each line is restricted to have identical slopes (Austin et al. 2001). This means the associations between environmental behaviors and the predictor variables are identical for each MSA (Austin et al. 2001; Heck and Thomas 2009). The random intercept model is the model of choice because I am interested in how community differences affect individual environmentally friendly behaviors and because I am testing whether environmental behaviors vary across MSAs.

I am assuming a model building approach to the analysis. This process involves five steps: 1) estimating the null model; 2) adding MSA variables; 3) including attitudes; 4) estimating a full parsimonious model; and 5) probing for cross-level interactions. Initiating the analysis with the MSA variables is done because I am interesting in determining if and/or how aggregate characteristics impact individual behaviors. By starting with the MSA analysis and adding individual level measures it may be easier detect changes in the relationship between aggregate measures and individual behaviors. This course of action entails the following:

1) Estimating the null model - The first step is an estimation of the null (or unconditional) model. For my study, the null equation assumes the following form:

$$\left.\begin{array}{l} ESFC_{1993} \\ ESAU_{1993} \\ EA_{1993} \\ EA_{2000} \end{array}\right\} Y_{ij} = \beta_{00} + r_{ij} + u_{0j} \qquad (1)$$

where Y_{ij} is the outcome for individual i and MSA j, β_{00} is the intercept or the model grand mean, r_{ij} is the individual level residual, and u_{0j} is the random MSA level effect (or the average deviation from the grand mean for those individuals located in MSA j). This model predicts the dependent variable as a function of the intercept and error terms without covariate measures or explanatory variables (Roberts 2007; Teachman and Crowder 2002). It looks for the presence of sufficient variation in the dependent variable in the absence of control or influential variables and provides an estimate of the intraclass correlation (ICC) (Roberts 2007; Teachman and Crowder 2002). ICC is:

$$\frac{\tau^2}{(\tau^2 + \sigma^2)} \qquad (2)$$

where the numerator (τ^2) is the between MSA variance in environmental actions and the denominator is the total variation in the model (τ^2 for between MSA and σ^2 for within MSA). The ICC provides evidence of what proportion of the variance lies within MSAs and what proportion of the variance lies between MSAs; the greater the ICC the greater the potential importance of aggregate level variables in explaining individual level outcomes (Roberts 2007; Teachman and Crowder 2002). It also informs as to whether a multi-level analysis is an appropriate statistical technique for my dataset. If the ICC is more than 0.1, then multi-level modeling is an appropriate statistical technique.

2) Adding MSA Measures - Utilizing information obtained from the null model, I estimate a series of four models with the MSA measures. I add aggregate measures to the model to evaluate how community characteristics affect environmentally sensitive behaviors. Because I am particularly interested in the influence of the objective environmental measure, the first model examines how the environmental measure impacts the environmental behavior. Subsequent models individually add region and MSA college education level to the model with the objective environmental measure with the final MSA model including all MSA measures.

3) Adding an Attitude Measure - The third step of this analysis, adding an attitudes measure to the model, has a two-fold purpose. The first is to evaluate the contribution of attitudes to explaining the variation in environmental behaviors. The second is to examine how the inclusion of attitudes changes or does not change the contribution of community characteristics in explaining the variation in environmentally sensitive behaviors. Each MSA characteristic is individually added to a model with attitudes and a final full MSA/attitudes model is the last model estimated in this step.

4) Estimating a Parsimonious Model - Once I have dissected the relative contribution of MSA characteristics and individual-level attitudes, theoretically estimated individual-level control measures are added to the MSA/attitudes model estimated in step 3. This is undertaken to control for the effect of measures established in the literature as being significant contributors to understanding individual environmentally friendly behaviors. Next, a parsimonious model is estimated by taking variables exhibiting significance in the full model along with all variables expressing significance in any of the 10 estimated models. The combined model for the intercept is as follows:

$$\left.\begin{array}{l} ESFC_{1993} \\ ESAU_{1993} \\ EA_{1993} \\ EA_{2000} \end{array}\right\} \; Y_{ij} = \gamma_{00} + \gamma_{10} X_{1ij} + \gamma_{01} W_{ij} + \gamma_{11} W_{1j} X_{1ij} + r_{ij} + u_{0j} \qquad (3)$$

where X is the individual level predictor variable and W is the aggregate level predictor variable such as MSA college education and mean air quality. In equation 3, I am assuming that the dependent variable, $Y_{ij,}$, is a random variable meaning it is measured with error as represented by u_{0j}. The intercept (γ_{00}) represents the overall mean level of environmentally sensitive behaviors across all MSAs taking into consideration the influence of individual and MSA characteristics. Because I centered all aggregate-level variables at the grand mean, the intercept represents the average level of environmentally sensitive behavior for the individual living in an area of average college education and air quality level or pesticide use. The γs are the slopes for the MSA variables and represent the influence of the specific MSA characteristics on the average level of environmentally sensitive behaviors.

5) Cross-Level Interactions – The final step in the process is probing for cross-level interactions. I am interested in whether MSA variables moderate the relationship between attitudes and environmental behaviors. Cross-level interactions are pursued for theoretically

significant relationships. I examine the data for MSA level variables that moderate the relationship at the individual level. To keep the cross-level measure in the model, the main effect for both variables and the cross-level effect must be statistically significant. If significance is not observed for any of the involved measures, the cross-level measure is dropped from the analysis and the final interpretative model will be the parsimonious model identified in step 4.

Model Fit

Model fit is evaluated by close examination of the summary measures. This includes tracking the fluctuation in the level one and level two variances, with the goal being a reduction in both from the level of the null model. Other statistics evaluated for model fit include the reliability and the deviance. The latter is a statistic that utilizes the χ^2 distribution; the lower the deviance, the better the fit. The null model is used as the baseline to evaluate the goodness of fit of subsequent models. The change in fit between models is assessed by examining the change in the χ^2.

Analytical Process with Imputed Data

Having inspected the data for patterns of missingness and identified that most individual-level measures are missing at random while the aggregate air quality data are not missing at random but ignorable, the next step is to impute the missing values. As previously mentioned, imputation entails substituting an estimate of the true value for a missing data point. This is done by predicting the missing value utilizing other variables from complete records within the dataset (Allison 2002; Wayman 2003). Then the missing values are replaced with the predicted values resulting in a complete dataset (Allison 2002; Wayman 2003). I am using multiple imputation, which involves repeating this process multiple times to produce multiple datasets. The identical analysis is then run on each dataset and the results are merged to produce a single average estimate for the entire analysis.

Multiple imputation offers several advantages over other generally used methods such as complete case analysis and mean substitution. It avoids the loss of information and statistical power that accompanies deletion of cases with missing data (complete case analysis). The process also precludes the reduction in the variable variance that can bias correlations downward as experienced with mean substitution. Imputing multiple values for each missing observation and averaging the estimates produces unbiased estimates and facilitates correct inference (Allison 2002; Wayman 2003). It does so by maintaining the natural variability in the data and preserving relationships with other variables in the analysis (Wayman 2003 p. 4)

The task of multiple imputation produces five (5) complete files for each of the datasets used in this study. Thus, five 1993 individual-level datasets are produced as well as five 1993 aggregate-level datasets, five 2000 individual-level datasets, and five 2000 aggregate-level datasets. Using the five imputed individual and aggregate-level datasets for the respective years, each model is estimated five separate times using the five datasets. For example, using the five individual and aggregate level datasets for 1993, five separate analyses are carried out for each model resulting in five sets of analytical results per model (including coefficients and standard errors of the coefficient). The five sets of coefficients and standard errors of the coefficients are then entered into an Excel spreadsheet where they are averaged into one overall estimate. The mean of those estimates is reported in the tables and a z-score is calculated. A z-score ≥2.0 is considered statistically significant.

In addition to the process of using imputed data, other special characteristics of the dataset are identified. Initial diagnostics for all variables was conducted, including correlation matrices, scatterplots, frequency distribution, and frequency summary statistics (tolerance, VIF, etc.), in the search for non-linearity, collinearity, or any anomaly that might affect the results. This process did reveal some issues that required addressing. Multi-collinearity among some of the MSA variables, specifically MSA college education level and MSA median family income was identified. Considering the literature focus on knowledge, and the inability to include a knowledge measure in the analysis due to a lack of available applicable measures, the decision was made to retain MSA college education level and drop MSA median family income from the analysis. A second issue is potential outliers. The analysis was re-run after removing potential outliers. The results do not change. No changes in the direction of the relationship or significance or size of the coefficient are observed between the analysis with and without the potential outliers. Thus, no cases were deleted based upon identification as an outlier.

The distribution of some of the dependent variables brought pause to the analysis. All of the dependent variables are interval in nature. Environmentally sensitive food consumption ranges from 0 to 3, environmentally sensitive automobile use ranges from 0 to 3, and environmental activism ranges from 0 to 4. Due to the range of the variables, a Poisson model was explored. Using one of the five datasets, the analysis was run as both an OLS regression and a Poisson regression analysis. No significance changes in the outcomes were observed between the analytical model and results for the OLS regression or Poisson analysis. Thus, the analytical results are considered robust and are the basis for this study.

Assumptions

In order to utilize HLM, certain assumptions need to be made, with most pertaining to the residuals. More specifically, I make the following assumptions that are required by the methodology:

- Sufficient intraclass correlation must exist on important variables. Key variables must exhibit a sufficient amount of within MSA variation (or there will be a lack of significant relationship(s) with environmentally sensitive behaviors) and between MSA variance (or there will be no significant relationships among the MSA level variables and the individual-level intercept and/or slopes).
- Within MSA residuals (i.e., the individual-level) are assumed to be independent and normally distributed with a mean of 0 and a variance of σ^2 (Bryk and Raudenbush 1992).
- Likewise, residuals at the aggregate level (i.e., the MSA level) are normally distributed with a mean of 0 and a variance of τ^2. The error at the aggregate level represents random effects associated with MSAs. In other words, it is the deviation of the intercept of each group from the overall intercept after taking into account the effect of the aggregate measures (Bryk and Raudenbush 1992; Diez Roux 2000).
- Residuals are assumed to be independent of predictors for the two levels (MSA and individual levels), respectively (Bryk and Raudenbush 1992; Hox and Maas 2001). For instance, predictors of environmentally sensitive behaviors that are not included in the within-MSA analysis (and, thus, whose effects are measured in the error term) are considered to be independent of the within-MSA predictors employed in the model (Bryk and Raudenbush 1992).

- Residuals at the individual level and the aggregate level are independent of each other (Bryk and Raudenbush 1992).
- Different residuals for individuals within the same aggregate unit of analysis (MSA) are allowed to be correlated though they are assumed to have a multi-variate normal distribution. Thus, I assume that behaviors for the individuals within MSAs are correlated due to the influence of community characteristics (Bryk and Raudenbush 1992; Hox and Maas 2001).

To recap, prior research suggests that individual environmentally sensitive behaviors are a product not solely of individual characteristics but also of community-level influences. However, empirical evidence of a relationship between individual environmentally sensitive behaviors and community-level characteristics is lacking. This study is designed to investigate this relationship by using multi-level regression analyses that considers the simultaneous effects of individual and community-level influences on environmentally sensitive behaviors. More specifically, the use of hierarchical modeling enables the estimation of a more realistic, and thus more accurate, model of the association between community characteristics, individual attributes and environmental behaviors.

CHAPTER 3

ENVIRONMENTALLY SENSITIVE FOOD CONSUMPTION

The use of pesticides is an integral part of the American agricultural production system (U. S. Environmental Protection Agency 1997; 2009). In 1995, 4.52 billion pounds of chemicals were used as pesticides in the United States, approximately one-fifth of the world's pesticide consumption (U. S. Environmental Protection Agency 1997). Of the pesticide used in the United States, approximately 77% is used in agriculture with the majority used on vegetables and crops (Committee on the Future Role of Pesticides in U.S. Agriculture et al. 2000; Calvert et al. 2008 U. S. Environmental Protection Agency 1997). Within the agricultural system pesticides are used on approximately 75% of U.S. farms with an average annual expenditure of nearly $4,200 per farm (U. S. Environmental Protection Agency 1997). This is equal to approximately $11.3 billion in 1995 dollars (U. S. Environmental Protection Agency 1997; Texas Center for Policy Studies 1999).

The use of pesticides has benefited society by dramatically increasing the food supply, enhancing the quality of food stuff, and reducing the cost of supplying agricultural products to an increasingly larger population (Calvert et al. 2008; U. S. Environmental Protection Agency 1997; 2009). As pesticides have become more prevalent, the risk of their use has also become more of a concern to the general public (Dunlap and Beus 1992; Sachs 1993). The increased knowledge regarding the use of pesticides, along with socioeconomic and community characteristics related to the agricultural system may manifest themselves in patterns of food consumption, which includes purchasing pesticide or chemical free foods. I am employing this line of thought to investigate whether these factors play a significant role in why individuals purchase, or do not purchase, certain foodstuffs. By using a multi-level approach, I am able to isolate and, thus, clarify, the effects of individual characteristics and community measures on the behavioral patterns of food consumption. This process consists of testing the following four hypotheses:

H_1: When controlling for theoretically significant individual level attributes, MSA characteristics predict the number of environmentally sensitive behaviors. Specifically:

a. The greater the proportion of MSA acres treated with pesticides, the more environmentally sensitive food consumption behaviors one will exhibit.
b. Northeast and West MSAs will exhibit more environmentally sensitive food consumption behaviors than Southern MSAs.
c. The higher the percentage of the MSA population with a college degree, the more environmentally sensitive food consumption behaviors one will exhibit.

H_2: The greater the concern about the effects of pesticides in food, the more environmentally sensitive food consumption behaviors one will exhibit.

H_3: Upon controlling for individual and aggregate level attributes, MSA characteristics moderate the effect of attitudes about environmental issues on environmentally sensitive behaviors. Specifically:

a. The proportion of MSA acres treated with pesticide moderates the relationship between attitudes about the effects of pesticides in food and the number of environmentally sensitive food consumption behaviors.
b. Northeast and Western MSAs moderate the relationship between attitudes about the effects of pesticides in food and the number of environmentally sensitive food consumption behaviors.

c. The percentage of the MSA population with a college degree moderates the relationship between attitudes about the effects of pesticides in food and the number of environmentally sensitive food consumption behaviors.

Testing of these hypotheses is accomplished in five steps: estimation of the intraclass correlation, a between MSA analysis, examination of the relationship between attitudes and MSA characteristics, estimation of a parsimonious model, and cross-level interactions. Following are the results of these stages and explanation of the findings.

Intraclass Correlation

The initial question to be answered is whether a multi-level analysis is an appropriate statistical technique for examining influences on environmentally sensitive food consumption behaviors. To address this question, the first step is to calculate the intraclass correlation (ICC). Estimating the ICC affords four major pieces of information (Heck and Thomas 2009). The first is it gives an estimate of the grand mean of environmentally sensitive food consumption behaviors for all individuals across all MSAs, which is 0.983 out of a range of 0 (environmental reasons never influence food consumption decision) to 3 (environmental reasons are always the basis of food consumption decisions). Thus, on average, individuals sometimes take the environmental into account when making decisions about food purchases.

The second piece of information is the reliability estimate, which is the average within MSA estimate of the population mean (Heck and Thomas 2009). For my sample, the average within MSA reliability across all MSAs is 0.298. This is rather low suggesting a limited amount of variation exists on environmentally sensitive food consumption behaviors between MSAs. The third piece of information the ICC supplies is the separation of the total variation in environmentally sensitive food consumption behaviors into within MSAs and between MSAs. The ICC is calculated as:

$$(0.030 / (0.896 + 0.030)) = 0.028 \qquad (4)$$

where 0.030 is the between MSA variance in environmental actions and 0.896 is the within MSA variation. This implies that approximately 2.8% of the variation in environmentally sensitive food consumption behaviors is attributable to differences between MSAs in the absence of any control variables and 97.2% of the variation is accounted for at the individual level. An ICC of 0.028 is lower than the 0.100 level previously indicated as the cutoff for the appropriate use of a multi-level analysis. However, the χ^2 of 129.163 is significant at the p=0.005 level (df=90). This suggests the null hypothesis, that the mean number of environmentally sensitive food consumption behaviors of all MSAs is equal, can be rejected. Thus, I conclude that significant variability in the mean level of environmentally sensitive food consumption behaviors exists across MSAs. As a result, I proceed with the multi-level analysis.

Random Intercept Model

The next step in my investigation of the influences on environmentally-sensitive food consumption behaviors is estimating multi-variate models. The goal of this analysis is to illuminate the role of aggregate and individual level influences on food consumption patterns. I first explore the role of MSA characteristics on individual behavior. Because I am particularly interested in the role of objective environmental measures, I estimate four models utilizing the pesticides variable and a combination of other MSA variables. Results of this step are presented in Table 12.

Between MSA Analysis

Using the null model as the starting point, Model 1 adds the environmental measure of proportion of MSA acreage treated with pesticides as the only predictor variable. By adding the pesticide measure, each MSA's average level of environmentally-sensitive food consumption behaviors has now been adjusted for differences in the proportion of acres treated with pesticides. This adjusted average (i.e., intercept) of 0.985 is statistically significant and minutely higher than the unadjusted average of 0.983 identified in the null model.

Although I am allowing the intercept to vary across MSAs, the coefficient for the pesticide measure is fixed. This means I am assuming that the effect of pesticide usage on environmentally sensitive food consumption behavior is the same across all MSAs. The measure is not significant and remains irrelevant through Model 4. The next two models introduce the region and MSA educational measures to the model with the pesticide variable. Western MSAs report significantly higher levels of environmentally sensitive food consumption (0.221) than Southern MSAs (Model 2). A significant positive contribution is also visible for the percent of MSA residents possessing a college degree (Model 3). The college variable is a significant predictor of individual food consumption behaviors with a 1% increase in the percent of residents with a college degree producing a 0.014 increase in environmentally sensitive food consumption behaviors.

Model 4 simultaneously examines the role of all MSA measures in predicting individual food consumption behaviors. The most obvious observation is the loss of significance for Western MSAs. By adding college, the West measure loses significance and the coefficient is reduced by nearly 27%.

Table 12: Level Two Model Estimates of the MSA Level Coefficients for Differences in Environmentally Sensitive Food Consumption (N=91)

	Null Model	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Intercept	0.983* (.034)	0.985* (.033)	0.908* (.053)	0.980* (.032)	0.925* (.050)
Proportion MSA Acres Treated w/Pesticides		-0.331 (.325)	-0.0.89 (.383)	-0.107 (.326)	-0.051 (.384)
Northeast MSA			0.132 (.083)		0.100 (.085)
Midwest MSA			0.042 (.099)		0.022 (.097)
West MSA			0.221* (.088)		0.162 (.085)
MSA %College Graduates				0.014* (.005)	0.011* (.005)
Level 2 Variance (U0)	0.030	0.030	0.023	0.021	0.018
Level 1 Variance (R)	0.896	0.896	0.898	0.898	0.900
Deviance	3493.667	3491.189	3496.104	3494.853	3498.814
Reliability	0.291	0.290	0.245	0.225	0.206
χ^2	129.163**	127.127**	114.768**	113.997**	107.955**

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at p<.05

These results tell me that community characteristics play a significant role in environmentally sensitive food consumption behaviors, which is supported by the model summary statistics. The level two variance declines across the models from that observed for the null model. A decline is also observed for the reliability, which points to a declining amount of variation of mean food consumption behaviors across MSAs. It also indicates that controlling for pesticide use, region of MSA and educational level has the effect of making MSAs more homogeneous in reported environmentally sensitive food consumption behaviors. Plus, the reduction in χ^2 for the region and college education models from the null model is significant implying that adding these community characteristics is an improvement in fit of the model. The drop in χ^2 between the null model and Model 4 (with all MSA characteristics) also suggests a significant improvement in fit between having no predictor variables in the model and adding MSA characteristics. However, the χ^2 for each model remains significant. Because I am allowing the intercept to vary across MSAs and each MSA's average environmentally sensitive food consumption behavior level has been adjusted for differences in MSA characteristics, the significance of the model χ^2 implies that important variation in mean food consumption behavior across MSAs still exist. The next step is to explore the influence of MSA level measures when attitudes about the use of pesticides in food production are added to the model.

Multi-level Models of Attitudes and MSA Characteristics

Due to its theoretical significance, I explore how attitudes about pesticides in food production affect the influence of MSA characteristics on environmentally sensitive food consumption behaviors. When environmental attitudes are the sole predictor in the model, they are significant positive predictors of food consumption behaviors, with a coefficient of 0.138 (Model 5 of Table 13). In other words, a one-point increase in attitudes toward environmental

Table 13: Multi-level Model Estimates of the Attitudes about Pesticides in Food and MSA Level Coefficients for Differences in Environmentally Sensitive Food Consumption (Level 1 N=1267; Level 2 N=91)

	Model 5	**Model 6**	**Model 7**	**Model 8**	**Model 9**
Intercept	0.987* (.033)	0.989* (.033)	0.935* (.059)	0.982* (.032)	0.947* (.057)
Proportion MSA Acres Treated w/Pesticides		-0.337 (.301)			-0.058 (.391)
Northeast MSA			0.101 (.085)		0.068 (.088)
Midwest MSA			0.009 (.085)		0.014 (.103)
West MSA			0.164 (.089)		0.105 (.088)
MSA %College Graduates				0.012* (.004)	0.010 (.005)
Attitudes-Pesticides in Food	0.138* (.020)	0.138* (.020)	0.136* (.020)	0.136* (.020)	0.135* (.020)
Level 2 Variance (U0)	0.030	0.030	0.026	0.022	0.024
Level 1 Variance (R)	0.829	0.829	0.830	0.831	0.832
Deviance	3401.373	3402.514	3408.551	3406.262	3414.176
Reliability	0.308	0.307	0.282	0.250	0.261
χ^2	133.025**	130.784**	123.474**	121.168**	117.705**

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at $p<.05$

sensitivity is accompanied by a 0.138 increase in the number of environmentally-sensitive food consumption behaviors. By adding environmental attitudes, the estimated level one variance is reduced from the null model by 7.5%. However, the reliability of the model controlling for attitudes increases to 0.308 from 0.291 of the null model while the deviance declines from 3493.667 in the null model to 3401.373 in the model with environmental attitudes.

Taking this model with the total effects for attitudes and adding MSA measures changes the community level story very little. MSA measures explain little of the small amount of level 2 variation. Only percent of the MSA population with a college degree is a significant predictor of environmentally sensitive food consumption behaviors when controlling for attitudes. However, when all MSA variables are simultaneously added to the model, the percent of college graduates measure loses significance and the size of the coefficient declines only slightly from Model 5. Comparison of Model 4 (with MSA predictors only) and Model 9 (with attitudes and MSA predictors) further solidifies the lack of interplay of MSA characteristics and attitudes.

These results suggest that the larger community variables have a minor impact on behavior. They also suggest that pesticide levels, MSA region, and MSA education level do not affect food consumption patterns by shaping attitudes towards pesticide use in food production. This appears to contradict Wakefield's et al. (2006) model that identifies community characteristics as primary influences on determining an individual's predisposition to act in an environmentally sensitive manner. The next step is to see if these relationships persist when individual level controls are added to the model.

<u>Full Multi-level Model</u>

Building on Model 9, theoretically significant individual-level control variables are added in an attempt to further distinguish the influence of MSA variables and the role of attitudes in environmentally sensitive food consumption behaviors. The results are presented in Table14. When all independent and control variables are included in the model (Model 10), no changes in significance or direction of coefficients are observed among the MSA variables and attitudes from that observed in the MSA/attitudes model (Model 9). There are also no drastic changes in

Table 14: Multi-level Model Estimates of the Coefficients for Differences in Environmentally Sensitive Food Consumption (Level 1 N=1267; Level 2 N=91)

	Model 10	**Model 11**
Intercept	0.661* (.114)	0.743* (.073)
Proportion MSA Acres Treated w/Pesticides	0.023 (.368)	
Northeast MSA	0.069 (.084)	0.058 (.085)
Midwest MSA	0.039 (.095)	0.022 (.080)
West MSA	0.131 (.085)	0.111 (.084)
MSA %College Graduates	0.011* (.005)	0.009 (.005)
Attitudes-Pesticides in Food	0.158* (.029)	0.124* (.019)
Age	0.003 (.002)	
Education	0.005 (.011)	
Females	0.182* (.052)	0.190* (.052)
Minorities	0.092 (.071)	
Household Income	-0.008 (.010)	
Suburban Residence	-0.014 (.067)	
Rural Residence	0.165 (.115)	
Politically Moderate	0.111 (.066)	0.107 (.066)
Politically Liberal	0.238* (.072)	0.227* (.069)
Religiously Moderate	0.075 (.091)	
Religiously Active	0.002 (.060)	
Good/Excellent Health	0.028 (.070)	
Level 2 Variance (U0)	0.017	0.017
Level 1 Variance (R)	0.822	0.821
Deviance	3438.640	3400.160
Reliability	0.206	0.205
χ^2	106.226	110.399**

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at p<.05

the size of the coefficients. The most obvious effects are the reduction of the intercept from 0.947 in Model 9 to 0.661 in Model 10, and the 17% increase in the attitudes coefficient (from 0.135 in Model 9 to 0.158 in Model 10).

Using these results, as well as outcomes from previous models, I estimate a more parsimonious model that includes variables exhibiting significance in any of the first 10 models. These results are presented in Model 11. By removing measures that did not significantly contribute to explaining the variation in food consumption behaviors, changes are noted in the pattern of significance and magnitude of effect among some of the variables of interest. Model 11 shows that when each MSAs average food consumption behavior has been adjusted for MSA measures, attitudes about pesticides, and individual control measures, the average level of environmentally sensitive food consumption behavior is a statistically significant 0.743.
A politically conservative Southern male who expresses the average attitude toward pesticides in food and who lives in a MSA with an average percent of college graduates, will report 0.743, or only occasionally, environmentally sensitive food consumption behaviors.

Revisiting the variance components finds that controlling for additional within MSA characteristics reduces variation between the MSA/attitude model (Model 9) and the most efficient model (Model 11). Adding level one control variables reduces the level one variance from the MSA/attitudes model by 0.011 or 1.3%, while the level two variance is diminished by 0.007 or 29.2%. Recalculating the ICC finds that variation between MSAs declines from 0.028 in the null model to 0.020 in the efficient model. Other model summary statistics provide further clarification on the fit of the model. Both the deviance and reliability estimates decline with the addition of the control measures. The reliability decreased from 0.261 in the MSA/attitudes model to 0.205 in the efficient model, which means that controlling for individual characteristics has the effect of making MSAs more homogeneous in reported environmentally sensitive food consumption behaviors.

Among the variables of interest, MSA measures and environmental attitudes, there are no changes in significance and only minimal changes in the size of the coefficients between the MSA/attitudes model (Model 9) and the most efficient model (Model 11). None of the MSA measures are significant predictors of environmentally sensitive food consumption behaviors when control measures are added to the model. Based on these results, I must reject H_{1A} that the level of MSA pesticide usage is an important contributor to food consumption behavior. Though both Western MSAs and MSA college educated level lose significance along the way, both appear to indirectly influence food consumption patterns in the efficient model. However, the outcome is similar to that observed for the model without control variables. Such is an indication that the indirect effects on behavior for both the Western MSA and MSA college variables persist even when individual characteristics are taken into account. Despite this observation of no significance in the efficient model, the results partially substantiate H_{1B} and H_{1C}. Western MSAs and the percent of the MSA population reporting a college education exhibit an effect, though indirectly, on environmentally sensitive food consumption behaviors.

The clearest result is observed for attitudes towards pesticide use in food production. Once this variable is added in Model 5, it never loses significance. Further, from Model 5 to the most efficient model (Model 11), the coefficient is reduced by only 10.1% (0.138 to 0.124). Given the product of Model 11, I can now estimate the average number of environmentally sensitive food consumption behaviors as a function of those select characteristics. For example, using the following full HLM equation, I can estimate the average number of environmentally sensitive food consumption behaviors for those believing pesticides are not dangerous at all (attitudes = 0), not very dangerous (attitudes=2), pesticides are somewhat dangerous (attitudes = mean of 6.56), very dangerous (attitudes=8), and pesticides are extremely dangerous (attitudes = 10):

$$0.743 + 0.058_{\text{northeast}}(0) + 0.022_{\text{midwest}}(0) + 0.111_{\text{west}}(0) + \quad (5)$$

$$+ 0.009_{\text{\%college}}(18.59) + 0.123_{\text{attitudes}}(6.56) + 0.190_{\text{females}}(0) +$$

$$+ 0.107_{\text{poliitcally moderate}}(0) + 0.227_{\text{politically liberal}}(0) + r_{ij} + u_{0j} + u_{5j}$$

The solutions are presented in Figure 2, which visually depicts the intercept for each group. As individuals increase their concern about the danger of pesticides in food, their food consumption behaviors become more environmentally conscious. For example, individuals who view the use

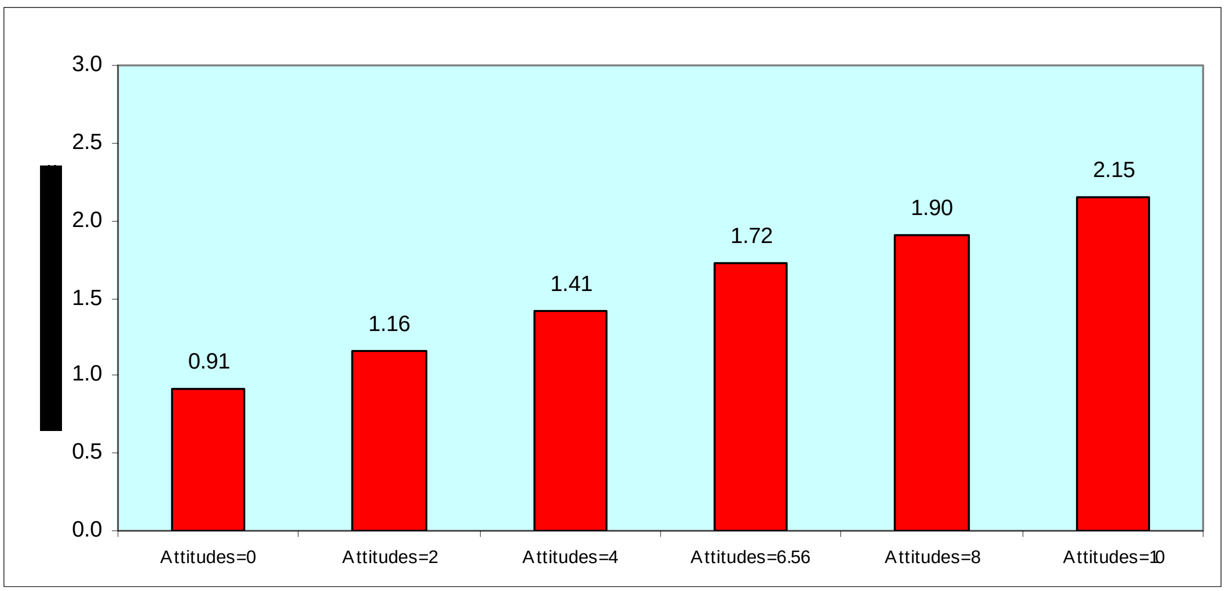

Figure 2: Mean Food Consumption Behaviors (Intercept) by Attitudes about Pesticides in Food

of pesticides as posing no threat at all (attitudes=0) report between never and sometimes purchasing food based on environmental reasons (0.91 behaviors). On the other hand, individuals who hold an average attitude about pesticide use (6.56 or consider pesticides as somewhat dangerous) report sometimes to often (1.72 behaviors) making environmentally conscious food consumption decisions. Ultimately, individuals identifying pesticides in food as extremely dangerous (attitudes=10) report the highest average number of environmentally sensitive food consumption behaviors, a mean of 2.15, or often purchasing pesticide free fruits and vegetables. Taking these results in their totality, I can safely confirm H_2 and confidently imply that attitudes about pesticides and chemicals in food significantly and positively influence environmentally sensitive behaviors.

Having established the influence of attitudes about pesticides and indirect effects of Western MSAs and MSA education level, the next step is to explore if MSA characteristics act as moderating factors in the relationship between attitudes and behaviors. That is accomplished by estimating cross-level models using the two MSA characteristics estimated in the efficient model.

Cross-Level Interactions

Wakefield's et al. (2006) model suggests that community characteristics indirectly influence environmental behaviors by shaping attitudes towards environmental issues. To clarify whether MSA characteristics moderate the relationship between attitudes and environmentally sensitive food consumption behaviors, I test the interaction effects between attitudes about pesticides and the MSA variables in the model; including Western MSA and percent of MSA residents with a college degree. The results are presented in Table 15.

The cross- level interaction term for attitudes about pesticides and Western MSA is significant (Model 12). Despite this observation, the main effect of the Western MSA variable is not significant and, thus, interpretation of the model is not warranted. The opposite pattern is observed for Model 13 where the direct effect of the percent of the MSA population with a college education is significant but the cross-level interaction term fails to find statistical

Table 15: Multi-level Model Estimates of the Individual, MSA, and Cross-Level Interaction Coefficients for Differences in Environmentally Sensitive Food Consumption (Level 1 N=1267; Level 2 N=91)

	Model 12	**Model 13**
Intercept	0.747* (.071)	0.742* (.073)
Northeast MSA	0.062 (.085)	0.058 (.085)
Midwest MSA	0.024 (.079)	0.023 (.079)
West MSA	0.089 (.084)	0.113 (.084)
MSA %College Graduates	0.010* (.005)	0.009* (.005)
Attitudes-Pesticides in Food	0.102* (.021)	0.121* (.019)
Females	0.182* (.051)	0.191* (.052)
Politically Moderate	0.105 (.065)	0.105 (.066)
Politically Liberal	0.220* (.068)	0.224* (.069)
Attitudes-Pesticides in Food x West MSA	0.116* (.031)	
Attitudes-Pesticides in Food x MSA% College Graduates		0.002 (.002)
Level 2 Variance (U0)	0.016	0.016
Level 1 Variance (R)	0.814	0.821
Deviance	3392.031	3407.494
Reliability	0.203	0.194
χ^2	110.728**	108.267

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at p<.05

significance. Thus, this model too does not necessitate further examination. With these results, I can safely reject the H_3 hypotheses that cross-level interaction effects are at work in individual environmentally sensitive food consumption patterns.

Summary

MSA characteristics along with attitudes are important influences when it comes to individual decisions about food consumption. Even in the face of limited variation across MSAs, the Western MSA and MSA college educated variables indirectly affect food consumption behaviors. While the contribution of the education variable to explaining the variance in food consumption behaviors is found to be a significant indirect effect, substantively the contribution of the variable is minimal due to the small coefficient. However, the MSA college education level is not the only MSA characteristic to play a role in food consumption behaviors. The Western MSA measure also is observed to be significant in earlier models though that significance disappears with the inclusion of additional explanatory variables. The variable loses significance and the coefficient is reduced by nearly 40% when the MSA college graduation measure is included in the model. This observed pattern may be an artifact of the geographical distribution of the college educated population, which tends to cluster in the West (mean of 22.4%) and Northeast (20.6%) compared to the Midwest (16.8%) and South (16.5%). Even though the measure loses significance, its effects are felt indirectly through educational patterns.

A somewhat surprising product of the analysis is observed for the attitudes measure. The significance of the variable in predicting food consumption behavior is not unexpected, though the absence of an effect on attitudes when MSA characteristics are added to the model is surprising. While, theoretically the lack of a narrative between attitudes and MSA characteristics is unforeseen given Wakefield's et al. (2006) conceptual model, the results concur with the correlation matrix, which reveals low correlation between attitudes and all MSA characteristics.

These results are specific to one expression of environmental behavior. A primary intent of this research is to examine the role of MSA characteristics on topical environmental issues. Disaggregating environmental behaviors avoids the assumption that all environmental behaviors and their influences are equivalent. Thus, I will follow the same methodological pattern established with food consumption behaviors to extricate the role of MSA characteristics and individual-level measures on environmentally-sensitive automobile use.

CHAPTER 4

ENVIRONMENTALLY SENSITIVE AUTOMOBILE USE

The automobile has played a primary role in shaping American culture by enabling suburbanization, defining patterns of economic development and energy use, and impacting quality of life. Efforts to promote public transit have had little effect, as the United States transportation network remains automobile-centered (Vandenbergh 2005; U. S. Environmental Protection Agency 2007). A side effect of this dependence on the combustion engine is air quality. Despite several decades of targeted efforts to reduce negative automobile emissions, over 186 million individuals, approximately half of the U.S. population, live in counties where the air is considered unhealthy (American Lung Association 2009). Because the combustion engine is one of the major contributors to air pollution, personal automobile use is one of the most polluting individual activities (Vandenbergh 2005; U. S. Environmental Protection Agency 2007). My goal for this chapter is to examine the elements that contribute to the individual-automobile relationship. I use a multi-level analysis to distinguish the various possible influences on patterns of automobile use. This is carried out by testing a series of four hypotheses addressing both individual and community level measures:

H_1: When controlling for theoretically significant individual level attributes, MSA characteristics predict the number of environmentally sensitive automobile use behaviors. Specifically:

d. The greater the proportion of days MSA air quality is considered unhealthy, the more environmentally sensitive automobile use behaviors one will exhibit.

e. Northeast and West MSAs will exhibit more environmentally sensitive automobile use behaviors than Southern MSAs.

f. The higher the percentage of the MSA population with a college degree, the more environmentally sensitive automobile use behaviors one will exhibit.

H_2: The greater the concern regarding the effects of automobile use on air quality, the more environmentally sensitive automobile use behaviors one will exhibit, net of the contributions of individual and MSA characteristics.

H_3: Upon controlling for individual and aggregate level attributes, MSA characteristics moderate the effect of attitudes about environmental issues on environmentally sensitive automobile use behaviors. Specifically:

a. The proportion of MSA days air quality is considered unhealthy moderates the relationship between the concern regarding the effects of automobile use on air quality and the number of environmentally sensitive automobile use behaviors.

b. Northeast and Western MSAs moderate the relationship between the concern regarding the effects of automobile use on air quality and the number of environmentally sensitive automobile use behaviors.

c. The percentage of the MSA population with a college degree moderates the relationship between the concern regarding the effects of automobile use on air quality and the number of environmentally sensitive automobile use behaviors.

The analysis will follow the pattern established with the food consumption analysis including estimating the intraclass correlation, and followed by a between MSA analysis, investigating the relationship between attitudes and MSA characteristics, estimating a parsimonious model, and exploring cross-level interactions.

Intraclass Correlation

Estimation of the null model initiates the examination of automobile use behaviors. Using the within MSA and between MSA variation estimates, the ICC for environmentally sensitive automobile use is calculated as:

$$(0.039 / (0.479 + 0.039)) = 0.075 \qquad (6)$$

where 0.039 is the between MSA variance in environmentally sensitive automobile use behaviors and 0.479 is the within MSA variation. This tells me that 7.5% of the variation in environmentally sensitive automobile use is due to differences between MSAs and 92.5% of the variation is attributed to within MSA differences, when no other variables are taken into account. As with food consumption behaviors, this is less than the proposed 0.100 cutoff for use of a multi-level statistical analysis. However, the significance of the χ^2 (198.45, p=0.000, df=90) suggests that significant variation in environmentally sensitive automobile use behaviors exists across MSAs.

In addition to the ICC, the null model offers a mean estimate of environmentally sensitive automobile use behaviors across all MSAs, which is 0.450 out of a range of 0 to 3. This means that, on average, when no predictors are taken into account, individuals report never to sometimes cutting back on driving a car for environmental reasons. The average within MSA estimate of the population mean of environmentally sensitive automobile use behaviors, the reliability estimate, is 0.481. As the sample size of the MSAs vary so will the reliability of the sample mean of environmentally sensitive automobile use behavior estimates (Heck and Thomas 2009). The reliability of 0.481 is the average MSA reliability estimate of environmentally sensitive automobile use across all MSAs. This really tells me that variance across MSAs is present that can be modeled by community level variables. The totality of these results suggests proceeding with estimation of a multi-level model is warranted.

Random Intercept Model

Between MSA Analysis

Proceeding with the analysis, I first carry out a between MSA analysis by examining how MSA characteristics affect environmentally sensitive automobile use behavior and each other. The results are presented in Table 16. The between MSA analysis begins by adding to the null model the environmental measure of the proportion of days MSA air quality was considered unhealthy (Model 1). The measure leaves no impression on the model. Not only is the variable not significant, there are no changes in the level 1 variance, the level 2 variance, and only miniscule changes in the deviance, reliability, and χ^2.

Conversely, changes are observed as other MSA variables are included in the next three models. When region of MSA is taken into account in Model 2, Northeast MSAs (0.120) and Western MSAs (0.434) are found to report significantly higher levels of environmentally sensitive automobile use behaviors than Southern MSAs. The effect of region in the model produces a change in the sign and size of the air quality coefficient, however the variable remains non-significant. Adding region does change the intercept from 0.450 in the null model to 0.364 in Model 2, meaning once the effect of region is removed, the average number of environmentally sensitive automobile use behaviors is reduced to 0.364 or almost never.

The next model (Model 3) adds a measure for the percent of MSA residents who have earned a college degree to the model with the air quality measure. The education measure is a significant predictor of automobile use behavior with a 1% increase in the MSA population e

Table 16: Level Two Model Estimates of the MSA Level Coefficients for Differences in Environmentally Sensitive Automobile Use (N=91)

	Null Model	Model 1	Model 2	Model 3	Model 4
Intercept	0.450* (.029)	0.450* (.029)	0.364* (.037)	0.444* (.026)	0.375* (.035)
Proportion of Days MSA Air Quality Unhealthy		0.105 (.500)	-0.141 (.349)	0.439 (.448)	0.098 (.330)
Northeast MSA			0.120* (.059)		0.086 (.057)
Midwest MSA			-0.031 (.053)		-0.030 (.050)
West MSA			0.434* (.070)		0.374* (.066)
MSA %College Graduates				0.019* (.004)	0.010* (.003)
Level 2 Variance (U0)	0.039	0.039	0.009	0.026	0.005
Level 1 Variance (R)	0.479	0.479	0.481	0.479	0.482
Deviance	2730.387	2728.114	2701.032	2721.668	2701.545
Reliability	0.481	0.486	0.186	0.393	0.122
χ^2	198.45**	197.70**	105.80	153.21**	96.97

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at $p<.05$

holding a college degree producing a 0.019 increase in the number of behaviors. While the education measure is significant, it's inclusion in the model has little effect on the intercept and the air quality variable remains inconsequential to explaining the variance in environmentally sensitive automobile use behaviors.

The aggregate picture begins to coalesce in Model 4, when all MSA characteristics are included in the model. Both MSA college educated and Western MSA retain their significance while Northeast MSA fades away. Further, the coefficient for both significant measures is reduced (MSA college educated by 47.4% and Western MSA by 13.8%). Support for the significance of region in predicting environmentally sensitive automobile use behaviors is evident in a review of the summary statistics, which reveals region to be the major aggregate player in predicting behavior. When the region variables join the model (Model 2), the level 2 variance is reduced from 0.039 in the null model to 0.009, the reliability is diminished by over 60%, and there is a statistically significant reduction drop in the χ^2. Thus, adding region explains the vast majority of the level 2 variance and, consequentially, makes the MSAs more alike in their automobile use behaviors. When the region variables are coupled with the measure of MSA college educated adults, the same pattern is observed with a further reduction in reliability. These observations provide key support for the proposition that MSA level measures are significant predictors of environmentally sensitive automobile use. The next step is to determine whether these relationships hold up when attitudes about automobile produced air pollution and control measures are added to the model.

<u>Multi-level Models of Attitudes and MSA Characteristics</u>

Taking the cue from Wakefield's model, attitudes toward automobile produced air pollution is the first individual level predictor variable added to the model with aggregate level

Table 17: Multi-level Model Estimates of the Attitudes About Automobile Produced Air Pollution and MSA Level Coefficients for Differences in Environmentally Sensitive Automobile Use (Level 1 N=1267; Level 2 N=91)

	Model 5	**Model 6**	**Model 7**	**Model 8**	**Model 9**
Intercept	0.454* (.028)	0.454* (.028)	0.375* (.037)	0.450* (.026)	0.386* (.036)
Proportion of Days MSA Air Quality Unhealthy		0.048 (.473)			0.023 (.332)
Northeast MSA			0.098 (.060)		0.070 (.059)
Midwest MSA			-0.024 (.052)		-0.027 (.051)
West MSA			0.390* (.068)		0.343* (.066)
MSA %College Graduates				0.016* (.004)	0.008* (.003)
Attitudes-Auto Produced Air Pollution	0.048* (.007)	0.048* (.007)	0.045* (.007)	0.047* (.007)	0.044* (.007)
Level 2 Variance (U0)	0.034	0.035	0.009	0.025	0.007
Level 1 Variance (R)	0.459	0.459	0.462	0.459	0.462
Deviance	2678.942	2680.466	2658.031	2677.396	2662.928
Reliability	0.462	0.467	0.193	0.397	0.169
χ^2	186.975**	186.650**	108.698	156.939**	102.722

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at $p<.05$

measures. Attitudes are positively and significantly related to environmentally sensitive automobile use when they are the sole predictor in the model (see Model 5 in Table 17). Consequently, as individuals become more sensitive toward automobile produced air pollution, their automobile use behavior becomes more environmentally responsive. Adding attitudes also increases the intercept slightly and it remains significant. The average level of environmentally sensitive automobile use across MSAs, after adjusting for attitudes towards air pollution resulting from use of automobiles, is 0.450 meaning individuals never to sometimes cut back on driving a car for environmental reasons.

After the addition of the attitudes measure in Model 5, the remaining aggregate predictors are added individually (Model 6-8) and together (Model 9). A somewhat similar pattern of significance is observed as in the between MSA analysis. The air quality, Northeast MSA and Midwest MSA measures remain silent through Model 9. Only attitudes, Western MSA and MSA college educated level appear to have a voice in shaping environmentally sensitive automobile use behaviors. Upon the addition of attitudes about automobile produced air pollution in Model 5, the variable never loses significance and the magnitude of the coefficient is barely touched by the inclusion of aggregate predictors in the model. From the initial estimated model (Model 5) to the attitudes-MSA characteristics model (Model 9), the coefficient is reduced by only 8.3%, with the majority of the effect observed with the addition of the region variables.

Among the aggregate measures, living in a Western MSA again appears to make the biggest impression on environmentally sensitive automobile use behaviors. When originally added to the model with attitudes about automobile produced air pollution, those living in a Western MSA report 0.390 significantly more environmentally sensitive automobile use behaviors than those living in a Southern MSA. This relationship is sustained even when attitudes and all MSA measures are included in the model, with the coefficient diminished by only 12.1% (0.390 to 0.343). While region is the major player, the percent of MSA residents with a college education also significantly contributes to the explanation of the variance in environmentally sensitive automobile use behaviors. When estimated with attitudes, environmentally sensitive automobile use behaviors increase 0.016 with every 1% increase in education level. This contribution is trimmed to a statistically significant, though practically irrelevant, 0.008, when all MSA measures are considered.

The power of the region measure is evident in the summary measures as well. When region of MSA is added in Model 7, the level two variance declines by 73.5%. The identical pattern is observed in Model 9 where attitudes and all MSA measures join the model. The reliability statistic takes a similar course, declining by 58.2%. It drops further when all MSA characteristics are added to the model, for a total reduction of 63.4%. Hence, adding attitudes and MSA level measures to the model makes MSAs more homogeneous in terms of their average environmentally sensitive automobile use behaviors.

These results convey the message that community characteristics influence automobile use patterns. They further suggest that their influence is not by way of influencing attitudes. This is contrary to Wakefield's et al. (2006) model that renders community characteristics as exogenous measures influencing attitudes, which in turn influence behaviors. It also is contrary to the neoclassical economic argument that focuses responsibility solely on individual level characteristics. However, at this point in the analysis, MSA characteristics directly impact automobile use patterns. I now test these seemingly direct effects when additional individual level measures are taken into consideration.

Full Multi-level Model

Table 18 presents the results for a full model and a parsimonious model that includes theoretically relevant individual-level control measures and variables identified as significant in any of the previously estimated models. The summary statistics hint at an improvement in model fit as both level 1 and 2 variances decline in magnitude, but only slightly. Further, the reliability declines from 0.169 in the attitudes-MSA model (Model 9) to 0.134 in the efficient model (Model 11); hence, MSAs are becoming more similar in terms of automobile usage when additional control measures are added. While the deviance statistic slightly declines as well (by 1.722), the reduction of the χ^2 between the attitudes-MSA model and the efficient model is not statistically significant.

The addition of individual-level control measures in Model 10 has only minor effects on the attitude variable and MSA characteristics. The air quality measure remains inconsequential as does the Northeast and Midwest MSA variables. Conversely, attitudes, Western MSA and the MSA college educated measures retain their significance with little effect on their coefficients. Taking only these significant measures, along with Northeast MSA, median household income, politically liberal, health, and both religion measures, into the parsimonious model (Model 11) provides the opportunity to remove much of the excess noise in the model. The outcome, as seen in Model 11, reveals little change among the significant predictors. The largest movement is seen for the intercept. While the measure increases between the attitudes-MSA model (Model 9) and the full model (Model 10), it drops 10.6% in the parsimonious model, from 0.386 to 0.345 (Model 11). Thus, all else being average, Western MSA residents identifying themselves as politically liberal, in good or excellent health, and either religiously moderate or active report

Table 18: Multi-level Model Estimates of the Coefficients for Differences in Environmentally Sensitive Automobile Use (Level 1 N=1267; Level 2 N=91)

	Model 10	Model 11
Intercept	0.413* (.083)	0.345* (.056)
Proportion of Days MSA Air Quality Unhealthy	0.096 (.327)	
Northeast MSA	0.077 (.058)	0.074 (.058)
Midwest MSA	-0.031 (.048)	-0.024 (.049)
West MSA	0.345* (.064)	0.346* (.066)
MSA %College Graduates	0.011* (.003)	0.010* (.003)
Attitudes-Auto Produced Air Pollution	0.042* (.007)	0.042* (.007)
Age	-0.000 (.001)	
Education	0.001 (.008)	
Females	-0.052 (.039)	
Minorities	-0.060 (.062)	
Household Income	-0.021* (.009)	-0.020* (.009)
Suburban Residence	-0.057 (.069)	
Rural Residence	0.039 (.091)	
Politically Moderate	0.062 (.042)	0.062 (.041)
Politically Liberal	0.178* (.053)	0.174* (.051)
Religiously Moderate	0.112* (.050)	0.104* (.049)
Religiously Active	0.128* (.049)	0.117* (.042)
Good/Excellent Health	-0.106* (.053)	-0.103* (.050)
Level 2 Variance (U0)	0.005	0.005
Level 1 Variance (R)	0.455	0.455
Deviance	2693.349	2661.206
Reliability	0.132	0.134
χ^2	96.090	98.450

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at $p<.05$

they never to sometimes (an average of 0.345) cut back on driving their car for environmental reasons.

The sharp change in the intercept is not reflected in the primary variables of interest. Air quality never plays a significant role in any of the models. Thus, it appears to have no bearing on how individuals utilize automobiles in consideration of the environment. Consequently, I am obliged to reject H_{1A} and surmise that air quality has no role in the decision making process of individual automobile use. However, other MSA variables are significantly involved in shaping automobile use. When individual-level control measures are considered, Western MSA and MSA college level retain their significance. Moreover, the size of the coefficients for both variables is minutely affected by the addition of the selected control measures. As the percent of MSA college educated residents increase, environmentally sensitive automobile use behaviors also increase by 0.010. This is a 25% boost over the attitude-MSA model, but still nothing substantial. However, it does confirm H_{1C} that the education level of MSAs is an important predictor of automobile use behavior. Likewise, Western MSAs report 0.346 more environmentally sensitive automobile use behaviors than Southern MSAs. This too is a slight increase (0.9%) over the attitudes-MSA model. The positive direct results for Western MSAs and the positive indirect effects of Northeast MSAs confirms H_{1B}. Obviously, these outcomes do not lend support to the neoclassical economic argument that individuals are not influenced by the larger social context.

At the individual level, holding environmentally sensitive attitudes towards automobile produced air quality significantly increases environmentally sensitive automobile use behavior by 0.042, net of MSA and individual level control measures. The variance in the size of the coefficient from Model 5 through Model 11 is quite small. Attitudes about air pollution enter the picture with a coefficient of 0.048 in Model 5 and hovers near that level through Model 11, where it is estimated at 0.042. Nevertheless, the results send a clear message that attitudes are a critical forecaster of driving habits when environmental conditions are considered. They also inform the decision to acknowledge H_2, that individuals' viewpoints on automobile produced air pollution do positively influence their pattern of automobile use. This lends supports to Wakefield et al.'s (2006) model that attitudes play a primary role in how individuals respond behaviorally to environmental issues.

While the analysis at this point has shown MSA measures and attitudes to be important predictors of automobile use behaviors, the χ^2 (98.450, p=0.169, df=86) for Model 11 is not statistically significant. This suggests that there is no additional significant variation in environmentally sensitive automobile use behaviors across MSAs after controlling for MSA and individual level predictors. However, I will explore whether the established relationships are modified once cross-level actions are contemplated.

<u>Cross-Level Interactions</u>

To test Wakefield's et al. (2006) model of aggregate influences on behavior, I estimate a model with cross-level interactions for attitudes with Northeast MSA, Western MSA, and percent of MSA residents with a college degree. As evident in Table 19, the models for both region variables exhibit only small changes from the efficient model (Model 11). No changes in significance or direction of coefficients are seen for any variables and, most importantly, neither cross-level interaction is statistically significant. However, the cross-level interaction is significant for the attitudes about air quality and MSA college educated variable. Because the main effects for both variables retain their significance when the cross-level measure is added to the model, the model merits closer examination.

Comparing the cross-level model (Model 14) to the efficient model (Model 11), there are no notable changes in the results. Both attitudes and MSA college educated population exert direct significant positive influences on environmentally sensitive automobile use behaviors, net of individual attributes, MSA characteristics, and cross-level effects. While the direct effects do not change, the significance of the cross level effect articulates the MSA college educated level

Table 19: Multi-level Model Estimates of the Individual, MSA, and Cross-Level Interaction Coefficients for Differences in Environmentally Sensitive Automobile Use (Level 1 N=1267; Level 2 N=91)

	Model 12	**Model 13**	**Model 14**
Intercept	0.345* (.056)	0.364* (.056)	0.338* (.057)
Northeast MSA	0.076 (.056)	0.075 (.057)	0.080 (.058)
Midwest MSA	-0.023 (.049)	-0.024 (.048)	-0.020 (.048)
West MSA	0.344* (.066)	0.333* (.069)	0.351* (.066)
MSA %College Graduates	0.010* (.003)	0.010* (.003)	0.010* (.003)
Attitudes About Auto Produced Air Pollution	0.044* (.008)	0.037* (.007)	0.040* (.006)
Household Income	-0.020* (.009)	-0.019* (.009)	-0.019* (.009)
Politically Moderate	0.063 (.040)	0.063 (.041)	0.060 (.040)
Politically Liberal	0.175* (.051)	0.174* (.052)	0.170* (.052)
Religiously Moderate	0.103* (.050)	0.101* (.050)	0.103* (.049)
Religiously Active	0.118* (.042)	0.116* (.042)	0.110* (.043)
Good/Excellent Health	-0.104* (.050)	-0.102* (.051)	-0.099 (.051)
Attitudes-Auto Produced Air Pollution x Northeast MSA	-0.010 (.013)		
Attitudes-Auto Produced Air Pollution x West MSA		0.025 (.019)	
Attitudes-Auto Produced Air Pollution x MSA% College Graduates			0.002* (.001)
Level 2 Variance (U0)	0.005	0.005	0.005
Level 1 Variance (R)	0.455	0.454	0.453
Deviance	2669.130	2667.121	2670.233
Reliability	0.130	0.125	0.134
χ^2	97.933	96.977	98.404

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at p<.05

as moderating the relationship between attitudes about automobile produced air pollution and environmentally sensitive automobile use behaviors. As education levels increase, attitudes become more sensitive toward automobile produced air pollution and environmentally sensitive automobile use behaviors increase an additional 0.002 over and above the direct effect of both attitudes and MSA college level. Thus, the level of MSA college educated population within an MSA modifies the relationship between attitudes and behaviors. Figure 3 provides visual evidence of the variation in intercepts based on the final analytical model (Model 14). Using attitudes about automobile produced air pollution and percent of the MSA population holding a college degree as the predictor variables, as

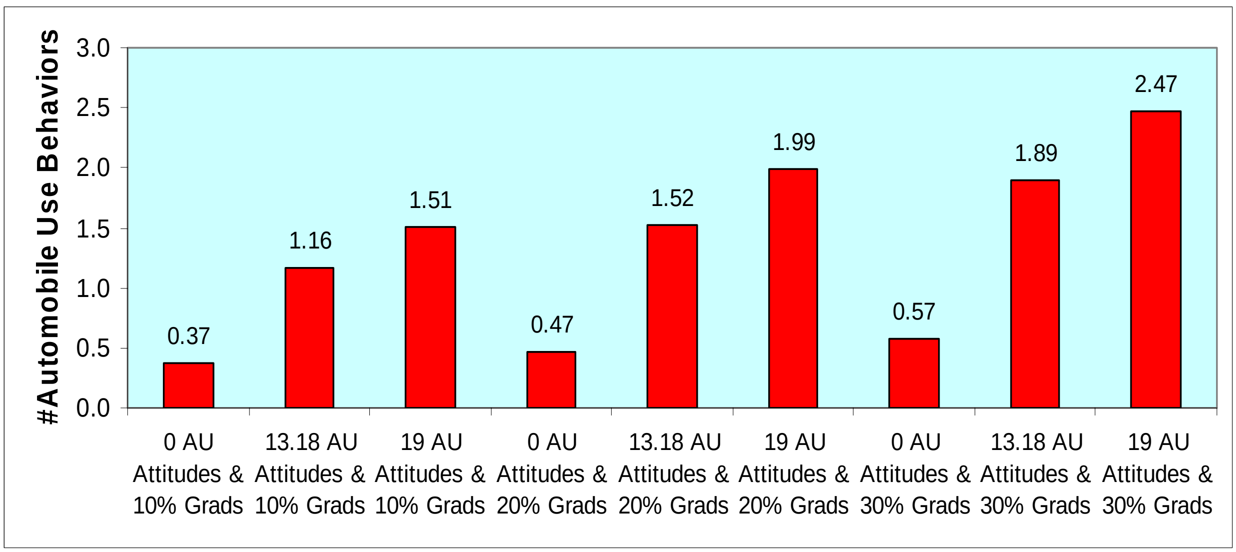

Figure 3: Mean Automobile Use Behaviors (Intercept) by Attitudes about Automobile-Produced Air Pollution and Percent of the MSA Population Holding a College Degree

individuals express increasing concern about the dangers of air pollution there is a corresponding increase in the number of environmentally sensitive automobile use behaviors. Further evidence is provided by solving the following Model 14 equation for three levels of attitudes about automobile produced air pollution (0 or not dangerous at all, the mean of 13.18 or somewhat dangerous, and 19 or extremely dangerous) and three levels of college graduation rates (10%, 20%, and 30%):

$$0.338 + 0.080_{northeast}(0) - 0.020_{midwest}(0) + 0.351_{west}(0) + \quad (7)$$

$$+ 0.010_{\%college}(10/20/30) + 0.040_{attitudes}(0/13.19/19) -$$

$$- 0.019_{income}(3.65) + 0.060_{moderate\ politics}(0) + 0.170_{liberal\ politics}(0) +$$

$$+ 0.103_{religion\ moderate}(0) + 0.110_{religiously\ active}(0) - 0.099_{good/excellent\ health}(0) +$$

$$+ 0.002_{attitudes\ x\ college}(\text{attitudes x \%college}) + r_{ij} + u_{0j} + u_{5j}$$

Per equation 5, all else being average, those who live in MSAs where 10% of the population hold a college degree and who identifying air pollution as not dangerous at all report almost never (0.37) changing driving habits for environmental reasons. At the opposite end of the spectrum, those expressing the highest level of concern regarding air pollution and who live in a MSA with a college graduation rate of at least 30% report modifying their driving habits due to environmental concerns often to always (2.47).

The question now is whether adding cross-level interaction improves the fit of the data to the model. Between the efficient model (Model 11) and the cross-level model (Model 14) there are few changes to the summary statistics. Also, the decline in the χ^2 between the models is not statistically significant. These elements imply that adding a cross-level measure does not significantly improve the model. Despite this acknowledgement, the results confirm H_{3C} that moderating effects are at play in molding individual choices in automobile usage.

Summary

Even when controlling for the influence of individual level characteristics, MSA characteristics remain important to the understanding how environmental issues affect individual driving habits. Living in a well educated MSA or in a Western MSA is a significant indicator of environmental sensitivity to how use of the automobile affects the environment. Both variables exhibit direct effects on automobile use behavior. This, coupled with the indirect effect of residence in a Northeast MSA, solidifies the significance of aggregate measures in explaining environmentally sensitive automobile use.

Two primary findings of particular interest are the role of the Western MSA variable and the lack of significance observed for the air quality measure**.** As stated above, the results show that the location of a MSA in the West has a direct effect on driving behavior based on environmental reasons. In fact, the variable appears to have one of the largest roles in shaping environmentally-sensitive automobile use behaviors. While I expected to see regionalism in environmental behaviors, this distinction of the West is somewhat unexpected. With it's dependence upon the automobile and the prominence of urban sprawl, I did not expect Western MSAs to play such a noteworthy role in influencing automobile use. However, closer examination shines some light on these results. A statistically significant (χ^2=99.553; $p<0.000$, df=9) majority of individuals in the Midwest (72.0%), Northeast (63.0%) and South (72.7%) report almost never considering the environment in their driving patterns. This is in contrast to residents in Western MSAs where 41.5% report almost never while 39.6% indicate they sometimes modify their driving habits for environmental reasons. These results may reflect a greater awareness among Western MSAs of the impact their driving behavior has on the environment. Or the results may be an artifact of other issues such as regional cultures and lifestyle or the sample of MSAs may be influencing the results. A higher percentage of individual, more rural, counties make up the South (35%) and Midwest (36%) MSAs compared to the Northeast (25%) and Western (25%) MSAs. Perhaps more significant is the MSAs composed of large cities. Among the 10 most populous MSAs in 1990, nine are represented in the sample of MSAs used in this research with both the West and Midwest represented by three each, two MSAs are located in the Northeast, and one in the South (one MSA was not represented in the sample). Further, among these nine MSAs (from which 21.5% of the total sample was drawn) the West reported the highest mean number of days the air was classified as unhealthy (19.6%) compared to the South (9.2%), Northeast (6.8%) and the Midwest (6.3%). This pattern may reflect urban design, planning, or age of the cities that compose the MSAs. Cities in the Northeast and Midwest MSAs are older than cities in Western MSAs. They also were established as industrial centers that reflect the social and political theories of their time. While I cannot provide a causal link between the sample of MSAs and the outcomes, it is a possibility that should be considered when evaluating the results.

The second unexpected observation is the insignificance of the air quality variable. Logically one would think that individual experience with poor air quality would influence ones behavior in contributing to that experience. However, at no point in the research on automobile use does air quality play a role. Yet, Western MSAs record a statistically significant ($F=12.896$; $p<0.000$, $df=3$) higher mean number of days air quality is unhealthy (9.8%) compared to MSAs in the Midwest (7.0%), Northeast (7.1%), or South (8.3%). For this sample of individuals, their experience with air quality appears to not influence driving patterns. Again, this may be a geographic artifact of the sample or it may be a reflection of other factors at work. The take away from the first two analyses is the significant role of MSA characteristics, both directly and indirectly, on environmentally sensitive behaviors that are considered as private, everyday behaviors. The next analysis examines if and/or how MSA characteristics influence a set of more public behaviors, environmental activism.

CHAPTER 5

ENVIRONMENTAL ACTIVISM

While awareness and apprehension about environmental issues is consistently documented as high among most populations, the level and type of response to these concerns vary widely (Seguin et al. 1998). The journey to environmental stewardship requires differing levels of investment in time, effort, energy, and money (Green-Demers et al. 1997; Seguin et al. 1998). One conduit is environmental activism, which is a concept encompassing specific behaviors such as lobbying, demonstrating, donating funds, and environmental education (Seguin et al. 1998). These activities are pathways to influencing the political, social, and cultural processes affecting the environment. While individual characteristics have been shown to influence the motivation to participate in shaping the patterns of environmental governance, higher level influences may be at work molding behavioral choices. My goal is to pinpoint those aggregate factors impacting the choice of behavioral participation through environmental activism. I use a multi-level format to distinguish the effects of community and individual level characteristics. This process is undertaken for 1993 and 2000 as separate analyses. For each year, the following four hypotheses are tested:

H_1: When controlling for theoretically significant individual level attributes, MSA characteristics predict the number of environmentally sensitive behaviors. Specifically:

a. The greater the proportion of MSA days air quality is considered unhealthy, the more environmental activism behaviors one will exhibit.
b. Northeast and West MSAs will exhibit more environmental activism behaviors than Southern MSAs.

c. The higher the percentage of the MSA population with a college degree, the more environmental activism behaviors one will exhibit.

H_2: Those in favor of environmental regulations will report more environmental activism behaviors.

H_3: Upon controlling for individual and aggregate level attributes, MSA characteristics moderate the effect of attitudes about environmental issues on environmentally sensitive behaviors. Specifically:

a. The proportion of MSA days air quality is considered unhealthy moderates the relationship between favoring environmental regulations and the number of environmental activism behaviors.

b. Northeast and Western MSAs moderate the relationship between favoring environmental regulations and the number of environmental activism behaviors.

c. The percentage of the MSA population with a college degree moderates the relationship between favoring environmental regulations and the number of environmental activism behaviors.

Testing of the hypotheses will be completed for each year (1993 and 2000) independently starting with the 1993 dataset. The analysis will follow the pattern established in previous chapters. Upon presentation of the results for the individual datasets, a summary and comparison of the results is proffered.

1993 Data

Intraclass Correlation

Using the level 1 and level 2 variances as noted in the null model of Table 20, the ICC for environmental activism is calculated as:

$$(0.064 / (0.746 + 0.064)) = 0.079 \tag{8}$$

where 0.064 is the between MSA variance in environmental activism and 0.746 is the within MSA variation. The calculated ICC specifies that 7.9% of the variation in environmental activism stems from differences between MSAs while 92.1% of the variation is a product of variation within MSAs. The ICC is just shy of the 0.100 self-imposed minimum value for employing the multi-level approach. Despite this, the χ^2 (201.629, p=0.000, df=90) is statistically significant denoting important variation in environmental activism is present across MSAs.

Another key piece of information garnered from the null model is the reliability. Estimated at 0.496, the reliability implies the presence of variation in environmental activism behaviors across MSAs. This provides further support to the decision to proceed with a multi-level analysis. Finally, the null model contributes an estimate of the grand mean of environmental activism behaviors across all MSA when no predictors are in the model, which is 1.123 activism behaviors out of a range of 0 to 4. With the identification of the presence of variation between MSAs, I now turn my attention to accounting for that variation.

Random Intercept Model

Between MSA Analysis

Results for the between MSA analysis is found Table 20. Model 1 finds the proportion of days MSA air quality is considered unhealthy is not a significant predictor of environmental activism. However, the measure is on the cusp of significance; with a z-score of 1.975 it just

Table 20: Level Two Model Estimates of the MSA Level Coefficients for Differences in Environmental Activism – 1993 (N=91)

	Null Model	Model 1	Model 2	Model 3	Model 4
Intercept	1.123* (.038)	1.128* (.037)	1.048* (.065)	1.116* (.031)	1.082* (.061)
Proportion of Days MSA Air Quality Unhealthy		-1.192 (.494)	-1.299* (.499)	-0.716 (.440)	-0.760 (.455)
Northeast MSA			0.159 (.107)		0.086 (.097)
Midwest MSA			0.024 (.093)		0.021 (.081)
West MSA			0.246* (.085)		0.073 (.080)
MSA %College Graduates				0.029* (.004)	0.027* (.004)
Level 2 Variance (U0)	0.064	0.060	0.053	0.026	0.027
Level 1 Variance (R)	0.746	0.746	0.747	0.748	0.748
Deviance	3294.979	3288.458	3291.880	3271.555	3278.009
Reliability	0.496	0.481	0.453	0.297	0.305
χ^2	201.629**	190.047**	169.549**	130.354**	127.289**

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at $p<.05$

misses the 2.00 cut-off. With the addition of the region variables in Model 2, the air quality measure comes into statistical significance. The coefficient also increases from -1.192 to -1.299, indicating that with each proportional increase in the number of days air quality is recorded as unhealthy, environmental activism behaviors decrease by 1.299. The same model perceives the West as the only region variable significantly contributing to explaining the variation in environmental activism behaviors. Residents of the West report 0.246 more environmental activism behaviors than Southerners.

The only other aggregate variable demonstrating significance in the between MSA analysis is the percent of the MSA population holding a college degree. The positive contribution of the college educated variable indicates that the more educated the MSA, the more environmental activism behaviors are reported by MSA residents. The education variable is the last significant contributor standing when all MSA variables are added to the model (Model 4). It also appears to be the driving force among the MSA variables in predicting environmental activism. When education is added to the model with the air quality measure, the level 2 variance is reduced by nearly half (59.4%), the largest reduction for the reliability is observed (40.1%), and there is a significant reduction in the χ^2 from the null model.

The MSA education variable is also the primary player among the predictor variables. Although the addition of the Western residence measure appears to have the greatest impact on the intercept, the significance of the West MSA variable disappears when confronted by the education measure. Because the West has the largest concentration of the college educated (a mean of 22.4%), the loss of significance for the West measure may be reflecting the role of knowledge in motivating individuals to participate in environmental activism behaviors. Thus, Western residence may be influencing environmental activism indirectly through the MSA education level. The next step is to explore if attitudes about environmental regulations modifies these observed relationships.

Multi-level Models of Attitudes and MSA Characteristics

Table 21 introduces the results of the MSA/attitudes multi-level model. Adding attitudes to the null model appears to have some positive effect on the fit of the model as both the level 1 (2.0%) and level 2 (12.5%) variances decline from that observed in the null model. Further, the drop in the χ^2 is significant providing some support for an improvement in fit. Examining the contribution of the attitudes variable finds the coefficient significant, with a 0.289 increase the number of in environmental activism behaviors for those expressing support for environmental regulations. The measure stays significant through Model 9 with the size of the coefficient reduced by less than 7% when combined with any and all other measures in the models.

Adding attitudes to the models with MSA variables does not appear to alter the pattern of significance and magnitude of effect observed in the between MSA analysis. Both the West MSA measure and the MSA college educated measure are significant when first added to the model with attitudes. However, when all variables are included in the model, Western MSA loses significance and the MSA college educated variable retains significance. This is identical to the pattern seen in the between MSA analysis. Further, the size of the significant coefficients is not drastically affected by the addition of attitudes to the model. The greatest effect appears to be on the intercept which declined from 1.082 in the MSA model (Model 4) to 0.923 in the full MSA/attitudes model (Model 9, a 14.7% reduction). Due to the similarity in pattern among the between MSA analysis and the MSA/attitudes multi-level models, attitudes do no appear to have major an effect on the role of MSA measures.

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Table 21: Multi-level Model Estimates of the Attitudes about Environmental Regulations and MSA Level Coefficients for Differences in Environmental Activism – 1993 (Level 1 N=1267; Level 2 N=91)

	Model 5	**Model 6**	**Model 7**	**Model 8**	**Model 9**
Intercept	0.948* (.043)	0.955* (.043)	0.874* (.067)	0.946* (.038)	0.923* (.064)
Proportion of Days MSA Air Quality Unhealthy		-1.027* (.477)			-0.645 (.447)
Northeast MSA			0.138 (.107)		0.064 (.095)
Midwest MSA			0.037 (.087)		0.021 (.078)
West MSA			0.221* (.093)		0.076 (.079)
MSA %College Graduates				0.028* (.004)	0.025* (.004)
Attitudes-Environmental Regulations	0.289* (.053)	0.285* (.052)	0.286* (.052)	0.273* (.051)	0.269* (.051)
Level 2 Variance (U0)	0.056	0.053	0.051	0.024	0.023
Level 1 Variance (R)	0.731	0.731	0.732	0.733	0.734
Deviance	3265.630	3263.627	3270.673	3249.533	3256.361
Reliability	0.469	0.466	0.450	0.284	0.293
χ^2	187.813**	179.171**	173.307**	130.501**	125.696**

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at p<.05

Full Multi-level Model

Assuming what has been learned in Model 9 and adding theoretically established individual-level control variables results in a full multi-level model as found in Model 10 on Table 22. There are no changes in significance for attitudes about environmental regulations or for any of the MSA characteristics. Coefficients for both attitudes and MSA college educated variables are reduced as is the intercept from 0.923 to 0.824.

Utilizing these results, all variables expressing significance in any of the 10 estimated models are maintained to estimate a parsimonious model. Model 11 in Table 22 displays the results for this more efficient model. There are reductions across the board in the summary statistics from the MSA/attitudes model, though the reduction in the χ^2 is not significant. Nonetheless, it appears the data are approaching a better fit to the model than witnessed in the MSA/attitudes model.

Upon adjustment for control measures and primary predictors, the average number of environmental activism behaviors is a statistically significant 0.972. Adding control measures produces no changes in significance among the primary variables of interest, though the magnitude of the coefficients is adjusted. The MSA college education variable declines by 16.0% from Model 9 to Model 11 and the attitudes coefficient is reduced by over 80%. Regardless of the diminished influence, an MSA's college education rate and individual attitudes about environmental regulations remain significant predictors of environmental activism. This result, along with the indirect effects of the air quality and Western MSA measures as suggested by the MSA analysis, challenges the neo-classical economic proposition that larger social and community forces do not influence individual behaviors. With these results, I can confidently accept H_{1C} and conclude that MSA characteristics are significant predictors of environmental activism. Further with the potential indirect effect of air quality, I can partially accept H_{1A} that once other MSA characteristics and individual attributes are taken into account, a MSA's air quality level indirectly influences the number of environmental activism behaviors. Partial support of H_{1A} is available because air quality assumes a negative rather than the anticipated positive role. An interesting result is observed for Western MSAs. As previously noted, the

Table 22: Multi-level Model Estimates of the Coefficients for Differences in Environmental Activism – 1993 (Level 1 N=1267; Level 2 N=91)

	Model 10	**Model 11**
Intercept	0.824* (.114)	0.972* (.064)
Proportion of Days MSA Air Quality Unhealthy	-0.708 (.381)	-0.700 (.408)
Northeast MSA	0.042 (.081)	0.048 (.084)
Midwest MSA	-0.026 (.071)	-0.031 (.073)
West MSA	0.011 (.073)	-0.014 (.071)
MSA %College Graduates	0.018* (.004)	0.021* (.004)
Attitudes-Environmental Regulations	0.178* (.050)	0.052* (.012)
Age	-0.002 (.002)	
Education	0.042* (.011)	0.055* (.009)
Females	0.144* (.050)	0.112* (.049)
Minorities	-0.270* (.089)	-0.296* (.088)
Household Income	0.012 (.012)	
Suburban Residence	0.003 (.078)	
Rural Residence	-0.142 (.097)	
Politically Moderate	0.100* (.045)	0.082 (.044)
Politically Liberal	0.396* (.059)	0.390* (.059)
Religiously Moderate	-0.008 (.067)	
Religiously Active	0.026 (.050)	
Good/Excellent Health	0.008 (.070)	
Level 2 Variance (U0)	0.016	0.018
Level 1 Variance (R)	0.683	0.678
Deviance	3205.184	3171.065
Reliability	0.224	0.248
χ^2	110.544**	115.161**

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at $p<.05$

MSA results suggest an indirect positive influence of the Western MSA variable. However, when control measures are added, the Western MSA variable remains non-significant and the direction of the coefficient changes from positive to negative. This suggests the nature of the indirect relationship between Western MSAs and environmental activism changes with Western MSAs reporting lower environmental activism behaviors than Southern MSAs. Consequently, I cannot confirm H_{1C}.

In addition to MSA characteristics, the other primary variable of interest, attitudes about environmental regulations, also retains significance when the contributions of individual and MSA characteristics are taken into account. Individuals who favor environmental regulations report an average of 0.052 more environmental activism behaviors than those who do not support government intervention in protecting the environment or who do not know whether they support it. This is clear evidence supporting Wakefield's model of the primary role of attitudes in determining behavior. It also provides support for the hypothesis that attitudes about environmental regulations positively predict environmental activism behaviors (H_2).

To obtain a clearer picture, the following efficient equation for Model 11 is solved for attitudes and three levels of MSA college educated (10%, 20%, and 30%):

$$0.972 - 0.700_{\text{air quality}}(0.07) + 0.048_{\text{northeast}}(0) - 0.031_{\text{midwest}}(0) - 0.014_{\text{west}}(0) + \quad (9)$$

$$0.021_{\text{\%college}}(10/20/30) + 0.052_{\text{attitudes}}(0/1) + 0.055_{\text{education}}(13.21)$$

$$+ 0.112_{\text{females}}(0) - 0.296_{\text{minorities}}(0) + 0.082_{\text{politically moderate}}(0)$$

$$+ 0.390_{\text{politically liberal}}(0) + r_{ij} + u_{0j}$$

Figure 4 visually depicts the solutions. Within attitudes about environmental regulations, as the percent of the MSA population holding a college degree increases so does the average number of environmental activism behaviors (i.e., the intercept). Within the college educated measure, those favoring government intervention report higher average numbers of environmental activism behaviors than their anti-regulation counterparts. This representation provides additional foundation for accepting both H_{1C} and H_2.

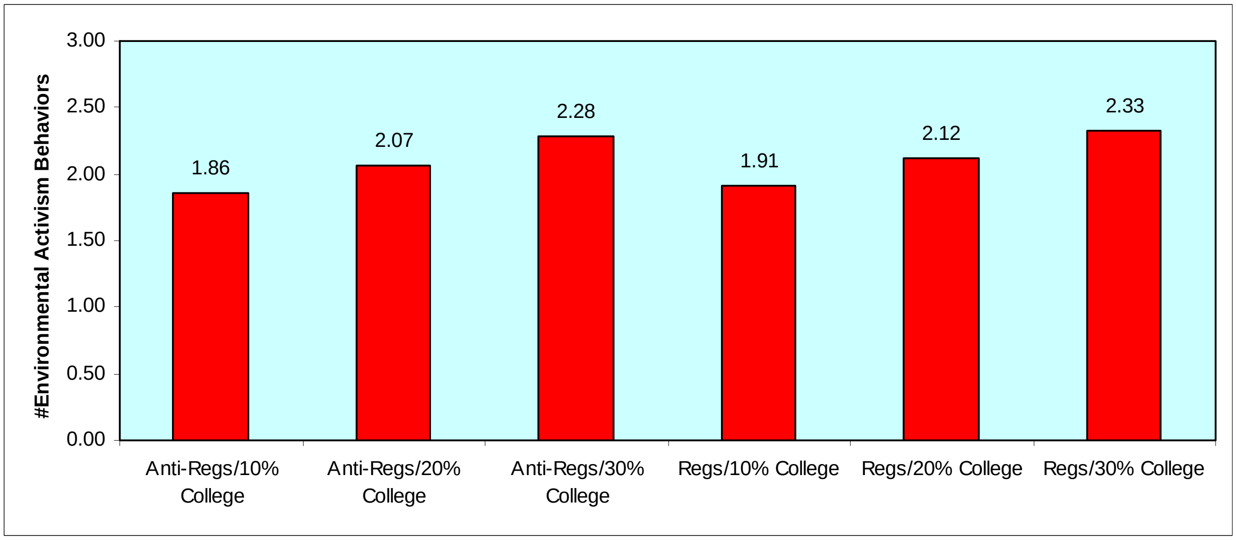

Figure 4: Mean Environmental Activism Behavior (Intercept) by Attitudes about Environmental Regulations and the Percent of the MSA Population Holding a College Degree - 1993

Cross-Level Interactions

With the demonstrated influence of both attitudes about environmental regulations and MSA measures, the task at hand is to distinguish if MSA measures modify the relationship between attitudes about environmental regulations and environmental activism. A model for each MSA variable identified significant in any of the previous models is estimated with a cross-level measure between the MSA variable and attitudes. Results for the three cross-level models are presented in Table 23 including models for attitudes and proportion of days MSA air quality was classified as unhealthy, attitudes and Western MSA, and attitudes and percent of the MSA population with a college education.

Table 23: Multi-level Model Estimates of the Individual, MSA, and Cross-Level Interaction Coefficients for Differences in Environmental Activism – 1993 (Level 1 N=1267; Level 2 N=91)

	Model 12	**Model 13**	**Model 14**
Intercept	0.975* (.063)	0.974* (.063)	0.972* (.064)
Proportion of Days MSA Air Quality Unhealthy	-0.683 (.410)	-0.714 (.412)	-0.700 (.408)
Northeast MSA	0.046 (.083)	0.049 (.084)	0.048 (.084)
Midwest MSA	-0.032 (.073)	-0.031 (.073)	-0.031 (.073)
West MSA	-0.020 (.073)	-0.020 (.073)	-0.014 (.071)
MSA %College Graduates	0.021* (.004)	0.021* (.004)	0.021* (.004)
Attitudes-Environmental Regulations	0.051* (.012)	0.046* (.014)	0.052* (.012)
Education	0.054* (.009)	0.055* (.009)	0.055* (.009)
Females	0.111* (.049)	0.110* (.049)	0.112* (.049)
Minorities	-0.295* (.088)	-0.296* (.088)	-0.296* (.088)
Politically Moderate	0.081 (.044)	0.081 (.044)	0.082 (.044)
Politically Liberal	0.390* (.059)	0.388* (.059)	0.390* (.060)
Attitudes-Environmental Regulations x Proportion of Days MSA Air Quality Unhealthy	0.247 (.204)		
Attitudes-Environmental Regulations x West MSA		0.034 (.025)	
Attitudes-Environmental Regulations x MSA% College Graduates			0.000 (.002)
Level 2 Variance (U0)	0.019	0.018	0.018
Level 1 Variance (R)	0.678	0.678	0.679
Deviance	3172.784	3176.796	3183.622
Reliability	0.254	0.252	0.247
χ^2	115.864**	115.592**	115.045**

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at $p<.05$

The cross-level interaction variables are not significant in any of the three models. Adding the cross-level interaction variables also does not modify significance for any of the established model variables including the main effect for attitudes and the MSA measures used for the cross-level measures. There is also little evidence of any improvement in the model by adding cross-level variables. I can only deduce that MSA characteristics, as measured in these models, do not modify the relationship between attitudes and environmental activism behaviors. Thus, I cannot accept H_3 that any of the MSA characteristics moderate the effect of attitudes about environmental regulations.

2000 Data

Intraclass Correlation

Model 1 of Table 24 presents the null model for the 2000 dataset. The grand mean of environmental activism behaviors is 0.558. Considering no influences on activism behaviors, an individual living in any of the represented MSAs will, on average, exhibit less than one environmental activism behavior. However, the reliability of 0.414 also says indicates that variation exists on environmentally activism behaviors between MSAs. How much variation is represented by ICC, calculated as follows:

$$(0.055 / (0.770 + 0.055)) = 0.067 \qquad (10)$$

where 0.055 is the between MSA variance in environmental activism and 0.770 is the within MSA variation. Approximately 6.7% of the variation in environmental activism behaviors is between MSAs while the majority of variation, 93.3%, is within MSAs. Despite the low ICC, I will estimate multi-level models based on the statistically significant χ^2 (179.341, p=0.000, df=99) that suggests significant variation across MSAs exist to be explained.

Random Intercept Model

Between MSA Analysis

Results for the between MSA analysis are presented in Models 1 through 4 of Table 24. The initial variable added to the null model is the proportion of days MSA air quality was classified as unhealthy. The variable is significant with a coefficient of -1.257 indicating that with each proportional increase in the number unhealthy air quality days, there is a drop in the number of environmental activism behaviors by 1.257. An alternative explanation may be that with each increase in environmental activism behavior there is a 1.257 drop in the number of unhealthy air quality days.

Taking the significant results of air quality, the next two models add measures for region of MSA and MSA education level to the model with the air quality measure. MSAs in both the Northeast (0.266) and West (0.199) exhibit significantly more environmental activism activities than MSAs in the South. This has the effect of reducing the coefficient for the air quality measure, yet air quality retains significance. When the MSA college educated variable is added to the air quality model, it too is seen as a significant and positive influence on environmental activism behaviors, with a 0.019 increase in behaviors for each percent increase in the MSA population holding a college degree. The air quality measure remains significant but the effect on the magnitude of the coefficient is the opposite as that observed when region is in the model. When the college educated variable is added to the model, the air quality coefficient increases from -1.257 to -1.378. Model 4 adds all MSA characteristics simultaneously. According to this final between MSA model, the two primary variables directly affecting environmental activism are air quality and MSA college graduates rates.

Table 24: Level Two Model Estimates of the MSA Level Coefficients for Differences in Environmental Activism – 2000 (N=100)

	Null Model	Model 1	Model 2	Model 3	Model 4
Intercept	0.558* (.036)	0.558* (.035)	0.438* (.052)	0.552* (.031)	0.467* (.050)
Proportion of Days MSA Air Quality Unhealthy		-1.257* (.509)	-1.200* (.397)	-1.378* (.458)	-1.297* (.421)
Northeast MSA			0.266* (.097)		0.186 (.095)
Midwest MSA			0.133 (.085)		0.120 (.081)
West MSA			0.199* (.086)		0.111 (.072)
MSA %College Graduates				0.019* (.005)	0.017* (.005)
Level 2 Variance (U0)	0.055	0.049	0.042	0.031	0.030
Level 1 Variance (R)	0.770	0.770	0.771	0.771	0.770
Deviance	3025.821	3022.289	3020.754	3012.996	3019.585
Reliability	0.414	0.389	0.354	0.289	0.286
χ^2	179.341**	170.977**	158.088**	145.630**	141.283**

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at $p<.05$

The summary statistics tell the story that all variables contribute to reducing the level 2 variance, deviance, and reliability. However, the biggest drop in level 2 variance and reliability is when the MSA college educated measure is added to the model. The level 2 variance declines by 43.6% and the reliability is reduced by 30.2%. Yet all models exhibit a significant χ^2 suggesting additional variance across MSAs remains to be accounted for.

The results show that when only aggregate measures are in the model, both air quality and MSA education level directly affect an individual's level of environmental activism. The significance of both region variables disappears when both the air quality and college measure are in the model. However, it should be pointed out that Northeast narrowly avoids significance with a z-score of 1.952 and a cutoff of 2.0. Looking closer at these relationships finds that MSAs in the Northeast (0.072) and Western (0.075) regions report the highest levels of mean number of days air quality is unhealthy compared to the Midwest (0.049) and South (0.065). Northeast (24.7%) and Western (24.2%) MSAs moreover report the greatest concentration of college education populations compared to the Midwest (20.6%) and South (20.3%). Thus, at this point in the analysis, region does appear to affect environmental activism though it may be influencing

behavior through the quality of the environment and MSA education level. While these results appear to support Wakefield's model and refute the neo-classical theoretical position, the next step is to estimate these relationships in the presence of attitudes about environmental regulations.

Multi-level Models of Attitudes and MSA Characteristics

Adding attitudes about environmental regulations appears to change the pattern of relationships among the MSA characteristics previously described. When the sole predictor in the model, attitudes positively and significantly contributes to explaining environmental activism

Table 25: Multi-level Model Estimates of the Attitudes about Environmental Regulations and MSA Level Coefficients for Differences in Environmental Activism – 2000 (Level 1 N=1152; Level 2 N=100)

	Model 5	**Model 6**	**Model 7**	**Model 8**	**Model 9**
Intercept	0.438* (.039)	0.438* (.037)	0.301* (.057)	0.432* (.038)	0.336* (.053)
Proportion of Days MSA Air Quality Unhealthy		-1.308* (.484)			-1.334* (.396)
Northeast MSA			0.289* (.093)		0.206* (.088)
Midwest MSA			0.170* (.083)		0.132 (.078)
West MSA			0.204* (.094)		0.109 (.069)
MSA %College Graduates				0.018* (.005)	0.016* (.004)
Attitudes-Environmental Regulations	0.278* (.060)	0281* (.060)	0.285* (.059)	0.278* (.060)	0.288* (.059)
Level 2 Variance (U0)	0.048	0.042	0.039	0.033	0.023
Level 1 Variance (R)	0.756	0.756	0.756	0.755	0.755
Deviance	3004.698	2996.855	3001.453	2996.562	2992.403
Reliability	0.389	0.359	0.342	0.304	0.241
χ^2	170.726**	163.409**	153.962**	147.836**	131.523**

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at $p<.05$

behaviors, and retains significance in the remaining four models of Table 25. Adding air quality and MSA education level slightly changes the influence of attitudes and the MSA variables in the respective models. However, there is a different pattern of significance for the region variables. All three region variables are significant predictors of environmental activism when initially added to the model with attitudes. However, when the air quality and MSA college educated variables are added in the full multi-level model, Midwest MSAs and Western MSAs lose significance while the significance of Northeast MSA is preserved. This is interesting given that residents of the Northeast express the lowest level of support for environmental regulations (39.1%) compared to Midwesterners (42.3%), Southerners (44.7%), and Westerners (47.6%) and the low correlation of attitudes with all other predictors variables (all ≤ 0.045). Nevertheless, Northeast MSA, which was very close to significance in the between MSA model, retains significance in the presence of attitudes about environmental regulations.

On the whole, adding attitudes to the between MSA model significantly improves the fit of the data. All summary statistics are reduced from the null model and the final between MSA model (Model 4). The level 2 variance is cut in half and the reduction in the reliability shows that MSAs are more alike when MSA characteristics and individual attitudes towards environmental regulations are used to predict environmental activism. There is also a significant reduction in the χ^2 between both the null model (179.341) and Model 9 (131.523) as well as between Model 4 (141.283) and Model 9 (131.523). Thus, adding attitudes about environmental regulations improves the fit of the model. Estimation of the MSA/attitude model also tells me that MSA characteristics are significant predictors of environmental activism behaviors even when attitudes are taken into account.

Full Multi-level Model

The next step is to add specific individual control measures that are established in the literature in an effort to identify a more parsimonious model. Model 10 in Table 26 presents the results of a full model and Model 11 presents a more efficient model utilizing variables exhibiting significance in any of the previous 10 models. When all significant variables are included in the model, individuals express an average of 0.354 environmental activism behaviors. Among the primary variables of interest, there are no changes in significance or direction of relationship. Even when individual level predictor variables are taken in account, MSA characteristics play a role in shaping individual activism behaviors. Northeast MSAs report 0.182 more environmental activism behaviors than MSAs in the South as do MSAs with a more educated population (0.011). Further, those expressing support for efforts to regulate the environment exhibit significantly more environmental activism behaviors (0.209) than those opposing such regulations. The Model 11 equation is solved to provide specific estimates of the average number of environmental activism behaviors for Northeast MSAs and MSA college educated (10/20/30%). The influence of the significant variables is shown graphically in Figures 5 and 6.

$$0.354 - 0.941_{\text{air quality}}(0.06) + 0.182_{\text{northeast}}(0/1) + 0.102_{\text{midwest}}(0) + 0.074_{\text{west}}(0) + \quad (11)$$
$$+ 0.011_{\text{\%college}}(10/20/30/40) + 0.209_{\text{attitudes}}(0/1) + 0.052_{\text{education}}(13.30) -$$
$$- 0.250_{\text{minorities}}(0) + 0.066_{\text{politically moderate}}(0) + 0.315_{\text{politically liberal}}(0) +$$
$$+ 0.149_{\text{religiously moderate}}(0) - 0.126_{\text{religiously active}}(0) + r_{ij} + u_{0j}$$

Within region it is possible to see the significant, though slight, effect of MSA education level. As the percent of a MSAs population with a college education increases, so does the number of environmental activism behaviors. Across region, a more obvious pattern is visible

Table 26: Multi-level Model Estimates of the Coefficients for Differences in Environmental Activism – 2000 (Level 1 N=1152; Level 2 N=100)

	Model 10	Model 11
Intercept	0.256* (.090)	0.354* (.060)
Proportion of Days MSA Air Quality Unhealthy	-1.117* (.381)	-0.941* (.393)
Northeast MSA	0.157* (.075)	0.182* (.078)
Midwest MSA	0.094 (.077)	0.102 (.080)
West MSA	0.058 (.067)	0.074 (.068)
MSA %College Graduates	0.011* (.005)	0.011* (.004)
Attitudes-Environmental Regulations	0.204* (.052)	0.209* (.054)
Age	0.000 (.002)	
Education	0.050* (.011)	0.052* (.011)
Females	0.080 (.050)	
Minorities	-0.232* (.074)	-0.250* (.073)
Household Income	0.000 (.009)	
Suburban Residence	0.004 (.073)	
Rural Residence	-0.015 (.120)	
Politically Moderate	0.038 (.055)	0.066 (.056)
Politically Liberal	0.292* (.086)	0.315* (.088)
Religiously Moderate	0.129 (.072)	0.149* (.073)
Religiously Active	-0.149* (.050)	-0.126* (.047)
Good/Excellent Health	0.109 (.074)	
Level 2 Variance (U0)	0.020	0.024
Level 1 Variance (R)	0.707	0.705
Deviance	2962.838	2935.397
Reliability	0.231	0.258
χ^2	124.816**	130.074**

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at p<.05

with the number of environmental activism behaviors higher for Northeast MSAs compared to MSAs with the same education level in the South. Conversely, as the proportion of MSA days that air quality is classified as unhealthy increases, the number of environmental activism behaviors decreases. Figure 6 illustrates the equation solved for six proportional levels of air quality, which ranges from 0 to 0.27. Individuals living in MSAs experiencing fewer days of unhealthy air quality report more environmental activism behaviors.

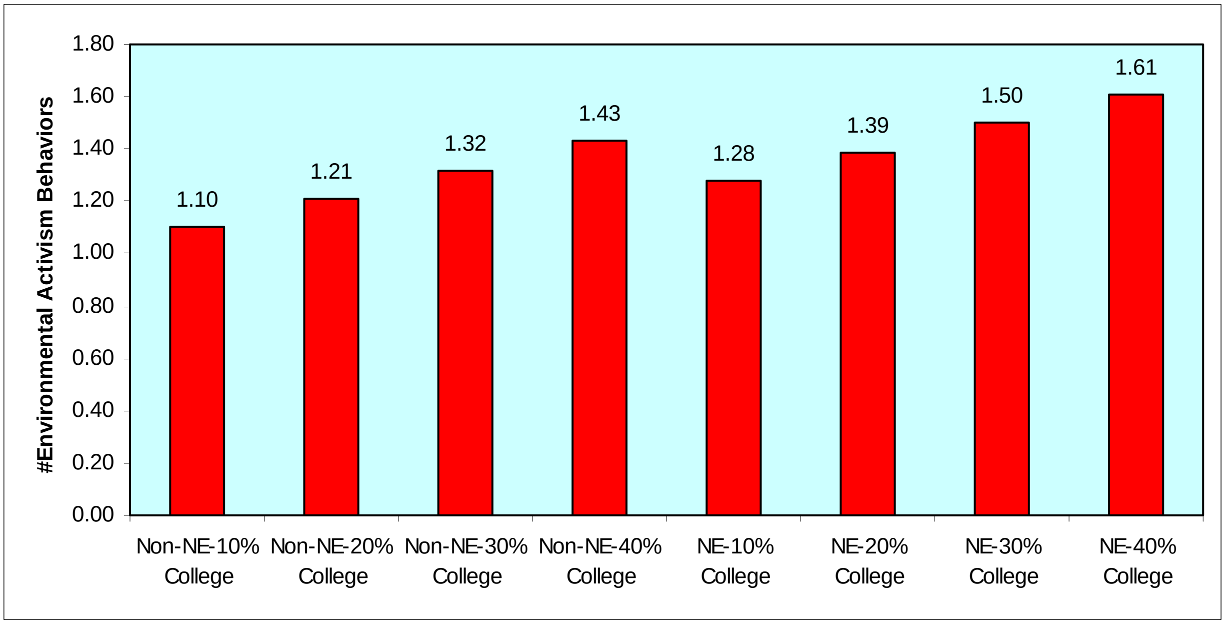

Figure 5: Mean Environmental Activism Behaviors (Intercept) by Northeast MSA and Percent of the MSA Population Holding a College Degree

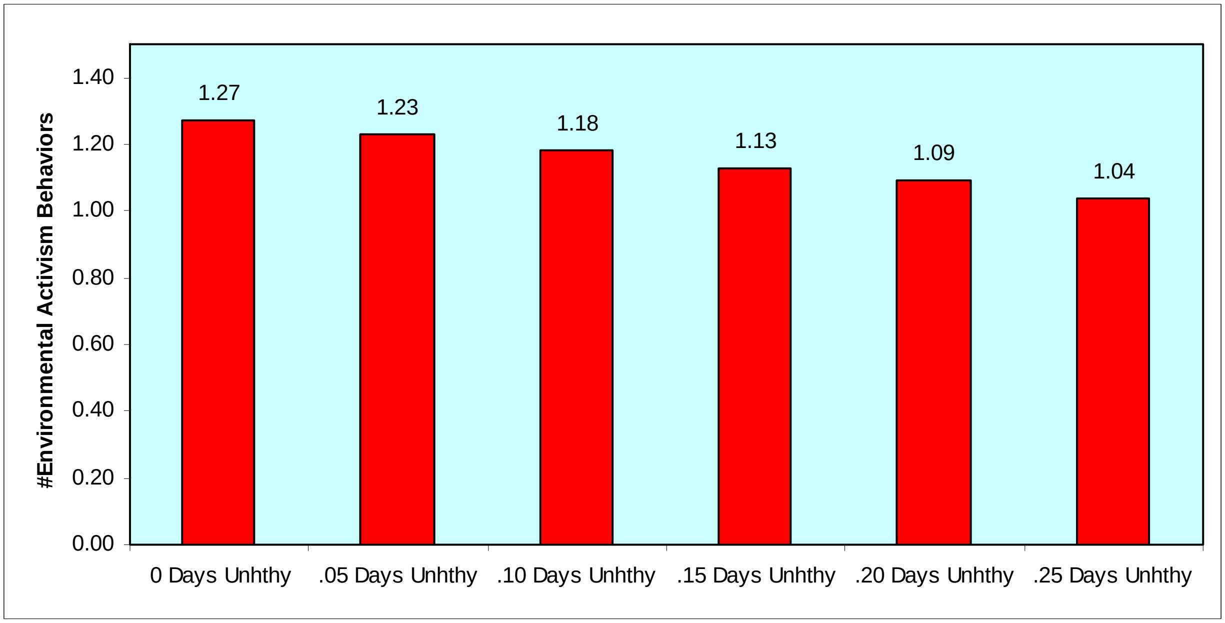

Figure 6: Mean Environmental Activism Behaviors (Intercept) by Proportion of Days MSA Air Quality Classified as Unhealthy

These results lead to two conclusions. The first is the confirmation at some level of all three H_1 hypotheses. Objective environmental measures are significance, though negative, predictors of environmental activism, which partially validates H_{1A}. The negative contribution of the air quality measure is not only significant but the magnitude of the coefficient suggests environmental quality plays a vital role in influencing individual decisions regarding activism. With the positive effects of Northeast MSAs and the positive indirect effect of Midwest MSA, H_{1B}.is also substantiated. In terms of H1C, MSA college educated, one of the most consistent community predictors, is a positive and significant predictor of environmental activism behaviors that demonstrates the accuracy of H_{1C}.

The second conclusion is the theoretical impact of the results. Community characteristics are significant influences on individual environmental activism behaviors. The results clearly indicate a direct effect for three of the MSA characteristics (air quality, MSA education level, and Northeast MSA) and indirect effects for two additional measures (Midwest MSA and Western MSA) on environmental activism behaviors. Acknowledging the importance of community measures challenges the neoclassical economic argument that individuals are not influenced by the larger social context.

Attitudes follow the pattern of the MSA characteristics and remain significant in the parsimonious model. Those expressing support for environmental regulations report 0.209 more activism behaviors than those not supporting environmental regulation efforts. The measure remains strong through all models with a reduction of only 24.8% from its initial entry into the model (Model 5) to the parsimonious model (Model 11). Solving equation 7 for attitudes and three proportional levels of days MSA air quality was classified as unhealthy (0, 15, and 25) shows the impact of these variables on behaviors. Figure 7 provides a visual record of the solution. As the proportion of MSA days of unhealthy air quality increase, activism decreases regardless of the position on environmental regulations. When attitudes about environmental regulations are considered, activism is higher in areas with better air quality among those expressing support for government efforts to protect the environment. Clearly I cannot deny H_2 of significance for attitudes about environmental regulations. Even in the face of MSA characteristics and other theoretically important individual-level measures, attitudes remains relevant to environmental activism. Accordingly, I can acknowledge the hypothesis of significant effects and conclude that an individuals' viewpoint on the role of government in the environment does influence their pattern of activism. This lends supports to Wakefield's model that attitudes play a primary role in how individuals respond behaviorally to environmental issues.

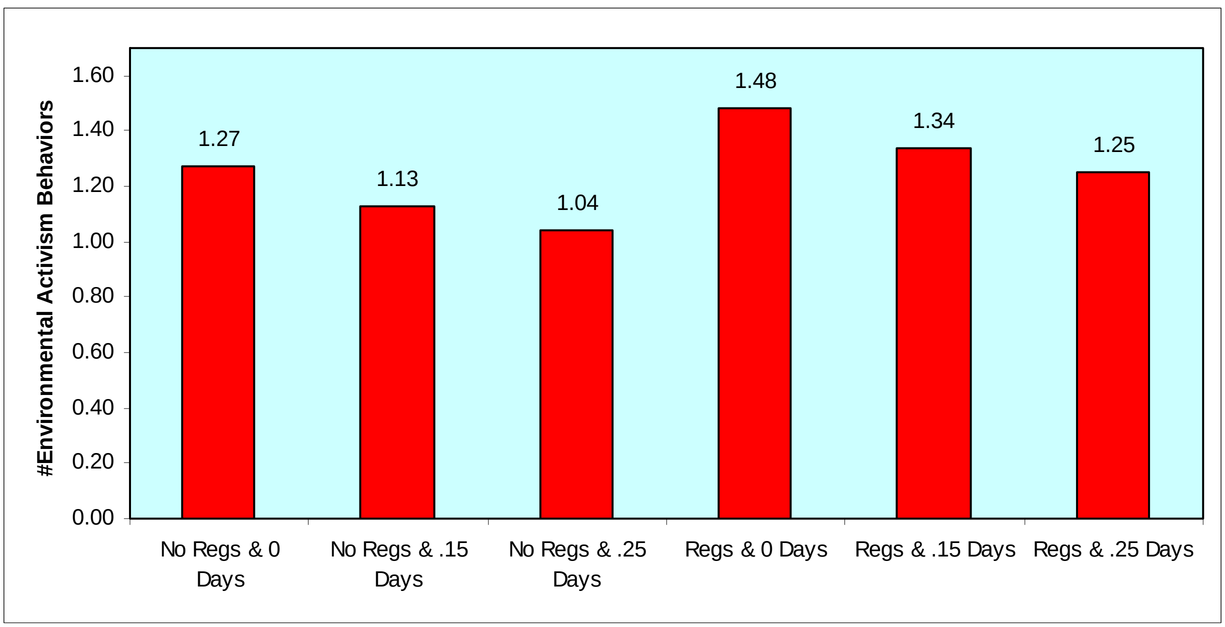

Figure 7: Mean Environmental Activism Behaviors (Intercept) by Attitudes about Environmental Regulations and Proportion of Days MSA Air Quality Classified as Unhealthy

Any question as to the effect on model fit can easily be answered by perusing the summary statistics, which does not change significantly from the MSA/attitudes model (Model 9). Despite adding theoretically significant control measures, the summary measures decline by less than 10% and the reliability increases from 0.241 to 0.258.. Further, the reduction in χ^2 between the MSA/attitudes model to the parsimonious model is not significant. For this reason, I cannot say that the full parsimonious model is an improvement in fit over the MSA/attitudes model

Cross-Level Interactions

I take the established model of environmental activism one step further by exploring for potential interaction effects across measurement levels. Five models are estimated, one for each MSA characteristic included in the parsimonious model. The findings are presented in Table 27. As evident from a review of the table, the primary story to be told is one of no effect. None of the interaction measures are significant. There are no changes in direction of any coefficients for individual or MSA variables. There are a few changes in significance that should be noted in Models 13 and 16. In both models, when the cross-level interaction is added to the model, the direct effect of the MSA characteristic loses significance. However, the cross-level interaction is not significant and, thus, the model do not warrant further review. Only minor changes to the size of other coefficients are noted when cross-level interactions are added. Further, the summary statistics are fairly stagnate, with little change to the level 1 or 2 variance, the deviance, or reliability. These results send a clear message that no moderating effects on attitudes are at work in the estimated models. This appears to oppose Wakefield's et al. (2006) model that identifies community level measures as one of the exogenous groups that mold attitudes and, in turn, determine environmental activism behaviors. Consequently, I cannot substantiate any of

Table 27: Multi-level Model Estimates of the Individual, MSA, and Cross-Level Interaction Coefficients for Differences in Environmental Activism – 2000 (Level 1 N=1152; Level 2 N=100)

	Model 12	**Model 13**	**Model 14**	**Model 15**	**Model 16**
Intercept	0.355* (.060)	0.364* (.062)	0.378* (.063)	0.348* (.062)	0.357* (.059)
Proportion of Days MSA Air Quality Unhealthy	-1.288* (.443)	-0.932* (.393)	-0.945* (.394)	-0.932* (.396)	-0.917* (.393)
Northeast MSA	0.183* (.078)	0.140 (.094)	0.178* (.078)	0.183* (.078)	0.179* (.077)
Midwest MSA	0.100 (.081)	0.102 (.081)	0.029 (.090)	0.103 (.080)	0.102 (.081)
West MSA	0.070 (.068)	0.075 (.068)	0.073 (.068)	0.102 (.082)	0.066 (.069)
MSA %College Graduates	0.011* (.004)	0.011* (.004)	0.011* (.004)	0.011* (.004)	0.005 (.005)
Attitudes-Environmental Regulations	0.207* (.053)	0.186* (.060)	0.166* (.065)	0.223* (.062)	0.199* (.054)
Education	0.052* (.011)	0.052* (.011)	0.052* (.011)	0.052* (.011)	0.052* (.011)
Minorities	-0.248* (.074)	-0.247* (.073)	-0.254* (.073)	-0.248* (.073)	-0.245* (.073)
Politically Moderate	0.066 (.056)	0.065 (.056)	0.062 (.056)	0.065 (056)	0.069 (.056)
Politically Liberal	0.315* (.087)	0.313* (.088)	0.316* (.087)	0.313* (.087)	0.320* (.088)
Religiously Moderate	0.146* (.073)	0.150* (.073)	0.142* (.071)	0.149* (.073)	0.149* (.072)
Religiously Active	-0.126* (.047)	-0.128* (.047)	-0.129* (.047)	-0.127* (.047)	-0.127* (.048)
Attitudes-Environmental Regulations x Proportion of Days MSA Air Quality Unhealthy	0.753 (.695)				
Attitudes-Environmental Regulations x Northeast MSA		0.112 (.138)			
Attitudes-Environmental Regulations x Midwest MSA			0.174 (.102)		
Attitudes-Environmental Regulations x West MSA				-0.063 (.117)	
Attitudes-Environmental Regulations x MSA %College Graduates					0.013 (.009)
Level 2 Variance (U0)	0.024	0.024	0.024	0.024	0.025
Level 1 Variance (R)	0.705	0.705	0.704	0.705	0.703
Deviance	2931.261	2935.075	2933.832	2935.592	2938.137
Reliability	0.257	0.255	0.260	0.256	0.265
χ^2	129.976**	129.594**	130.261**	129.561**	131.550**

Numbers in parentheses ( ) are standard errors
*statistically significant z-score
**statistically significant χ^2 at $p<.05$

the H_3 hypotheses of significant moderating effects of attitudes about environmental regulations on environmental activism behaviors, when individual and MSA characteristics are taken into consideration.

Comparison of Analytical Results

Because some of the questions utilized in the development of control measures in the environmental modules for 1993 and 2000 datasets were not identical, the two datasets were not pooled. Each dataset was treated as cross-sectional and analyzed separately. However, the analyses proceeded through identical steps, which facilitate comparability of the results. For the two datasets, the starting points are different. The ICC is higher for 1993 (7.9%) than for 2000 (6.7%) so more of the variation in environmental activism behaviors occurs across MSAs in 1993 than in 2000. The same can be said for the reliability, which starts (1993 is 0.496 compared to 0.414 for 2000) and remains higher for the 1993 sample than for the 2000 dataset. MSAs are initially more different in 1993 than in 2000. Even though the dependent variable is calculated identically, the 1993 null model suggests a higher average behavioral level than the 2000 null model. In 1993, when no predictor variables are included in the model, individuals report an average 1.123 environmental activism behaviors. By 2000, that number declines to 0.558. This pattern continues throughout the two analyses with the 1993 sample consistently reporting higher average levels of environmental activism regardless of the predictor variables in the model.

Similarities emerge when models are estimated with the predictor variables. MSA college educated and attitudes about environmental regulations are consistent predictors of environmental activism behaviors throughout the analysis for both datasets. While the relevant coefficient contribution is small for the MSA education measure, it is more noteworthy for the attitudes measure. Both variables express direct effects on environmental activism behaviors. Another consistency between the analyses is observed for the Western MSA measure. For both datasets, Western MSAs come into play when added to the model with attitudes about environmental regulations and to the model with the air quality measure but loses significance when the MSA college measure is included as a predictor. Such reaction is indicative of an indirect effect for Western MSAs, possibly by way of the MSA education level. Western MSAs report the highest average percent of college educated in 1993 (22.4%) and second highest in 2000 (24.2%). However, other indirect avenues may be at work. It is possible that MSAs sampled from the Western region are different in composition than MSAs in other parts of the country. It is also possible that the sample of MSAs in the West and Northeast (which is significant in the 2000 analysis) are composed of larger cities where environmental awareness is heightened or the experience with environmental conditions are more acute. As previously stated, the South and Midwest MSAs are composed of a greater percentage of individual counties that are more rural, than the West and Northeast MSAs. Yet other possibilities include lifestyles that are more nature-oriented or variation in the political orientation of MSA residents. The results tell us that those holding liberal political philosophies report more environmental activism behaviors, and for this sample, there is a statistically significant difference (χ^2=12.604, $p \leq .006$) among the four regions in terms of liberal persuasion with the West (32.4%) and Northeast (29.6%) reporting the larger percentage of the population identifying themselves as politically liberal followed by the Midwest (23.2%) and South (21.8%).

Despite these similarities, other patterns differ between the datasets. One of the most obvious is the size of the attitudes coefficient. Through model 9, the coefficients are somewhat similar in both analyses (0.269 in Model 9 for 1993 and 0.288 in Model 9 for 2000). However, when individual level controls are add in the most efficient model, the coefficient for the 1993 attitudes measure drops 80.7% while it is reduced by 27.4% for the 2000 attitudes coefficient. Another major difference between the analyses is the role of Northeast MSA and Midwest MSA variables. Both are significant positive predictors of environmental activism in 2000 but neither plays a role in the 1993 analysis. The analyses also diverge on the role of air quality. In 1993 air quality plays an indirect role, engaging when added to the model with the region variables. However, it quickly loses significance and never regains prominence in the remaining models. Yet, in the 2000 dataset, air quality is a major player. After it is added in Model 1, the measure remains significant throughout the analysis. Whereas the measure may have an indirect effect in 1993, the 2000 analysis portrays air quality as having a direct effect on environmental activism. Unfortunately, the results do not inform us as to the origin of the relationship. Is it that more environmental activism results in cleaner air or is it that cleaner air does not motivate the population to act on environmental issues? The totality of the outcome only enlightens us to an influence that deserves further investigation.

When it comes to cross-level interactions, the analyses are more similar than different. While the models tested in the respective analyses were not all identical, none of the cross-level interactions are significant for either 1993 or 2000. Because there were no modifying effects of MSA characteristics on the relationship between attitudes about environmental regulations and environmental activism, the interpretative model was established as the parsimonious model for each dataset. Both analyses are finalized with the acknowledgement that the χ^2 remains significant suggesting important variation across MSAs remains to be explained for both samples.

CHAPTER 6

SUMMARY AND CONCLUSIONS

The ultimate goal of this study was to build models examining the varying dimensions of environmental behaviors as influenced by community characteristics. By placing environmental behavior within a sociological framework, it is possible to describe and visualize the primary social factors contributing to environmental behaviors of individuals within a community setting. My endpoint is the identification of community level characteristics that play a role in how individuals choose to act in an environmentally sensitive manner.

A primary criticism of previous research on environmental behaviors is the overwhelming focus on the role of attitudes and individual-level characteristics. Despite this concentration on individual-level causes and solutions, variation in environmental behavior remains. As individual behavior becomes an increasingly significant source of pollution, a better understanding of the factors influencing individual behavior is critical to addressing environmental degradation. This study contributes to our understanding of this enduring variation and the role environmental and community context plays in environmentally sensitive behaviors.

Because the area of community influence on environmental behaviors is lacking the guiding principles of a primary theoretical structure, the study was undertaken utilizing two theoretical frameworks. Neoclassical economics contends that individuals make behavioral decisions based not on any influences from the larger social context but on a rational, individual cost-benefit analysis. Equally, a theory proposed by Wakefield et al. (2006) hypothesizes that individual and social characteristics cooperate to shape individual attitudes to act environmentally. Testing these two frameworks through a series of hypotheses provides insight into how the larger social context influences or does not impact individual decision making when it comes to environmental behaviors. The results are valued for identifying possible pathways to understanding what prompts individuals to act in an environmentally sensitive manner.

Multi-level analyses yielded models revealing significant associations between community level measures and individual environmental behaviors. Objective environmental conditions, region of MSA and MSA education level are significantly associated with environmentally sensitive food consumption behaviors, environmentally sensitive automobile use, and environmental activism behaviors, though their influence assumes diverse forms. Among the community measures, MSA education level plays the cardinal role as the primary social process that produces change in all environmental behaviors. In three of the four models, MSA education level exhibits direct effects on behaviors and in a fourth model the measure demonstrates an indirect effect on environmental behavior. MSA education level is also revealed to moderate the relationship between attitudes about automobile produced air pollution and automobile use behaviors.

However, MSA education level is not the only significant community measure. Region of MSA is also a characteristic that must be considered when evaluating environmental behaviors, particularly for those living in the West and Northeast. The results infer that residence in a Western MSA directly impacts expressions of environmental behavior when it comes to automobile use. It also indirectly influences individual decisions on food consumption behaviors and participation in activist opportunities. Residence in a Northeast MSA also leaves an impression on behavioral decisions. Living in a Northeast MSA indirectly influences how individuals use automobile transportation and it directly impacts their activism behavior. These results for region appear to be tied to other MSA characteristics in the model, particularly the education level of the MSA. Other than the direct effect of Western MSA on automobile use, the region variables appear to indirectly influence environmental behaviors primarily through the educational measure. For the majority of models, when the MSA college educated variable is added, the significance for the region variables is lost and the size of the coefficient is reduced. This may be the result of the geographic distribution of the more educated. The populations of the West and Northeast MSAs are more highly educated than the populations of the Midwest or South. However, the education variable is not the sole potential foundation for regionalism in this research. Western MSAs also report a higher average number of days air quality is considered unhealthy and they tend to be more politically liberal than other regional MSAs. For this study, these characteristics appear to distinguish Western and Northeast MSAs from MSAs in other parts of the country and influence the expression of environmental behaviors.

One of the more noteworthy outcomes is observed for the objective environmental measure of the proportion of days MSA air quality is considered unhealthy. Indirect effects are found for the air quality measure for environmental activism in 1993. It appears air quality inversely affects behavior by way of MSA college measure. By 2000, the profile of air quality has been raised among the public. Not only is the measure negatively associated with activism, it has a direct influence on individual activism behaviors about environmental issues.

Theoretical Implications

Placing these results within the proposed theoretical framework captures the genuine impact of the study. The findings provide not only justification for supporting or rejecting the proposed hypotheses, they also provide insight as to the form of the relationship between the primary variables of interest and the behaviors under study. The first hypotheses, that MSA characteristics are significant predictors of environmental behaviors, was clearly confirmed for each of the analyses**.** MSA characteristics, particularly MSA college education level, are consistent predictors of food consumption, automobile use, and activism behaviors. Regardless of whether the observed influences are direct or indirect, the results suggest that MSA characteristics should not be ignored when evaluating environmental behaviors. This position is further substantiated given that statistical significance was observed while controlling for factors most closely linked to environmental behaviors, i.e., race, gender, and political philosophy.

These results have particular consequences for the neoclassical economics approach. The educational level of the MSA, region of MSA, and environmental conditions all have a say in individual decisions to act environmentally. If the assumption can be made that the estimated models are correct, then the results indicate a causal link between where one lives and the individual decision to act environmentally. Living in a well educated MSA, particularly in the West or Northeast suggests higher environmental participation. Conceptually, this relationship appears to be bi-directional. Residence in a MSA with a higher college education rate may influence knowledge level of environmental issues and result in higher participation rates. This position finds supports from Kaiser and Fuhrer (2003) and Kaiser et al. (1999) who identify knowledge as a necessary precursor to acting in an environmentally sensitive way. Conversely, environmental programs or services may attract the more educated to reside in regions with a quality environment. This latter may help explain the results for the objective environmental conditions. I anticipated that those experiencing deteriorated environmental conditions would respond by exhibiting behaviors conducive to environmental sensitivity. However, the results suggest that those exhibiting the most environmental activism behaviors were more likely to live in MSAs with lower levels of pesticide use and better air quality. This may reflect the higher level of environmental activism producing a quality environment or it may illustrate the more environmentally prone choose areas with lower pollution levels. The determination of the causality is a topic for future studies.

Regardless of the direction of the relationship, the results refute the concept that individuals act independently of the larger social context and base behavioral decisions on an internal evaluation of maximizing utility and minimizing costs**.** The results do not challenge Axelrod and Lehman (1993), Derksen and Gartrell (1993), and others who find that cost and convenience are deciding factors in the performance of environmentally sensitive behaviors. These characteristics may very well be decisive behaviors factors**.** However, they clearly are not enough. This study shows that individual environmental behavior decision making is not simply a market exchange, but social forces are at work in the individual decision-making process as suggested by Cahuc et al. (2008) and van den Bergh (2003). By participating in environmentally sensitive behaviors, the individual benefit may not be solely market exchange with the only goal being a gain in resources; the goal and individual gain may be an improved environment.

Not only does the significance of the MSA measures have implications for the neoclassical economic theory, the results also have implications for the social context framework as represented by Wakefield's et al. (2006) model. Community characteristics are one of the primary exogenous groups that shape attitudes according to the model. However, the model does not portray community-level measures as directly influencing environmental behaviors. Yet in this study, community measures are shown to directly affect environmental behaviors or indirectly impact environmental behaviors through other community level characteristics. As a result, the significant direct effects observed for MSA characteristics in predicting behaviors supports Wakefield's et al. (2006) proposition of the importance of community characteristics but does not support how those characteristics contribute to shaping environmental behaviors.

Wakefield et al (2006) specifically states that community level measures and exposure characteristics (along with individual and social network characteristics) mold predisposition and capacity to act, which, in turn, influence environmental behaviors. However, the direct effects demonstrated in this study suggest there is more to the story. Among the possible explanations is a suggestion that community characteristics influence the adequacy and quality of community services, which facilitate environmental behaviors. Abel and Stephan (2000) and Jones and Rainey (2006) among others have shown that a community's capacity to react to environment issues is related to community socioeconomic context as well as the general hierarchy of needs. Environmental infrastructure may not be as mature in communities with lower socioeconomic and sociodemographic levels as it is in more resourceful communities (Abel and Stephan 2000; Evans and Kantrowitz 2002; Jones and Rainey 2006). By establishing individuals in local environmental networks, influencing the adequacy and quality of environmental community services, and enhancing an individuals ability to act environmentally, the influence of community measures may reach beyond influencing attitudes and capacity (Evans and Kantrowitz 2002; Israel et al. 2001).

Other aggregate measures, specifically the direct effect of air quality on environmental activism in the 2000 analysis, is an interesting outcome that also does not fully support Wakefield's model. According to the model, environmental quality should not directly impact environmental behavior. Yet the results inform us that the number of days air quality is considered unhealthy does have a direct, inverse effect on environmental activism. As environmental activism increases, the number of days air quality is unhealthy declines;

alternatively, as the number of days air quality is considered unhealthy increases, environmental activism declines. This does not support Inglehart (1995) who suggests geographical variation in severity of environmental degradation is mirrored by geographical support for environmental protection with the highest levels of support found in areas facing the most severe environmental problems. Using Inglehart's (1995) logic, one would consider that environmental activism is higher in areas with poorer environmental quality. However, the results inform us the opposite is the case; air quality improves as activism increases. These results are not surprising when considered within the environmental justice literature, which has shown that communities populated by minorities and lower socioeconomic levels have poor environmental quality (Adeola 2000; Bullard 2000; Evans and Kantrowitz 2002). Yet these are the communities with fewer resources to address environmental issues. Thus, it is not surprising that activism decreases as the quality of the air declines. This does not coincide with studies suggesting that the broader environment within which one is established positively influences environmental behavior, as those living in poorer environments that necessitate activism tend to not exhibit activist behaviors. However, the results do lend support to those professing the need to consider the broad community, and not just environment, is key to understanding the individual world and how that world affects environmentally sensitive behavior.

Alternatively, the influence of objective environmental conditions may mold an individual's experience thereby motivating them to action. Blake (2001) states that the primary influence on attitudes towards environmental problems are not individual attributes but objective contextual measures such as pollution levels and industrial composition. Indirect effects are observed for the air quality measure in the 1993 environmental activism analysis. However, these indirect effects appear to be related to other MSA measures, specifically MSA college education level and Western residence. This does not lend support to Wakefield's et al. (2006) model nor does it support Blake's (2001) proposition on the connection between environmental quality and attitudes.

Despite the limited support tendered the social context model by the MSA results, two results do support Wakefield's et al. (2006) model: The first is the primary role exhibited by attitudes in predicting all environmental behaviors. Attitudes is one of the most consistent predictors in each of the models. This reinforces the essential role Wakefield et al. (2006) affords attitudes in the model. The literature has established a modest, inconsistent association between attitudes and behaviors (Kaiser et al. 1999; Kollmuss and Agyeman 2002). Schultz and Zelezny (2003) went further by showing that environmental behaviors can take place in the absence of environmentally sensitive attitudes. While this analysis does not test that hypothesis, it does demonstrate that attitudes are an important feature to consider when diagnosing environmental behaviors.

The second, and perhaps more important, outcome that appears to support Wakefield et al. (2006) are the cross-level interaction results for MSA college education level and attitudes for automobile use behaviors. Indirect effects are the key to the success of Wakefield's et al. (2006) model. The observed significance of the cross-level interaction mirrors Wakefield's et al. (2006) argument that aggregate characteristics indirectly influence behaviors by shaping environmental attitudes. Schultz et al. (2005) and others find that an understanding of environmental issues as well as personal values are the basis for a foundation for concern regarding environmental quality and influence environmental behavior (Blake 2001; Kaiser et al. 1999; Kaiser and Fuhrer 2003; Schultz and Zelezny 1999; Stern and Dietz 1994; Stern et al. 1995). These studies suggest that individuals holding values consistent with environmentally related issues express higher levels of concern about environmental problems. They also report more environmentally friendly behavior including higher levels of recycling, political activism, consumer behavior, and general willingness to assume environmentally sensitive actions (Mainieri et al. 1997; Poortinga et al. 2004; Schultz et al. 2005). Another significant element concerning the cross-level interaction is that it involves the MSA education level and attitudes. As previously addressed, knowledge has been shown to be an important element in predicting environmental behaviors (Kaiser and Fuhrer 2003; Kaiser et al. 1999). Combining education level with its knowledge component with attitudes makes for a powerful, and logical, influence on selected environmental behaviors.

Recommendations for Future Research

The theoretical implications of this study should stimulate further discussion on the manner in which community-level characteristics impact individual environmentally sensitive behaviors. The results of this study certainly suggest the need for additional research on the contribution of aggregate measures to environmental behaviors. During the course of the research, problems and issues were encountered that should be dealt with in future research. Many of these issues revolve around the data. This study used cross-sectional data to test a causal model. Cross-sectional data are one-dimensional and do not allow the identification of dynamic relationships through which social systems are transformed (Bailey 1982). Using cross-sectional data in this study illuminates the relationship between community characteristics and environmental behaviors. However, it is not be possible to assert that any single community influence has a causal impact on environment behavior. Because I can only describe the current relationship, I can only infer causation. More in-depth examination of the relationship between community-level measures and environmental behaviors would benefit from the use of longitudinal data or a rolling cross-section design (Brady and Johnson 2008).

A second recommendation is a more full development of measures utilized in this study. The limitation of measures in this study is the product of using secondary data. While the use of secondary data is advantageous in terms of temporal and financial aspects, the data needs for the present analysis are not completely satisfied. Problems center around four areas. First, a confounding variable(s) that is not available in the dataset(s) may be excluded from the analysis resulting in poor internal validity. This may adversely affect the results of the study because a variable(s) that has not been considered in the analysis may lead to false conclusions (a spurious relationship) (Agresti and Finlay 1997).

Second, questions available in the dataset are limited, which may affect the development of concepts vital to the study as well as adversely influence the results. The nature and wording of the questions used in the development of the measures of environmental attitudes and environmental behaviors may not adequately tap the concepts I am attempting to ascertain. The development of more rich and complete measures is restrained due to deficiencies in the original data. Also, the environmental attitudes and environmental behaviors questions may be confounded in that environmental attitudes may vary systematically with environmental behaviors thereby making it difficult to distinguish any true relationship.

Third, use of self reported data in the development of the dependent variables may adversely affect the measure of environmental behavior. While self-reports are the predominant method of collecting data on attitudes and behaviors, the validity of such data have been questioned (Babor et al. 2000; Brener et al. 2003). Self-reported data may be compromised by such issues as sensitivity of the information being collected, recall issues, or social desirability bias (Randall et al. 1993). More objective measures of environmental behavior such as electric bills for power usage, pounds of garbage disposed, or gallons of gasoline used could provide more accurate portrayal of environmental behaviors. However, these data are not available.

Fourth, more refined objective environmental measures could significantly enhance the capability to determine the effect of environmental quality on environmental behaviors. Due to the location of monitoring stations, air quality data are not available for all counties. Further, where they are available, air quality measures cover a wide geographical area, potentially reducing the accuracy of individual experience with environmental exposure. Prospective research on environmental behaviors should employ more community based air quality measures.

Another area that forthcoming research should address is adding measures that capture community services and social networks. The inability to consider the role of social networks and community regulation and services in encouraging and facilitating environmental participation of its citizens is a drawback to this study. The inclusion of these community-level measures was prohibited due to the deficiencies in the publicly available data. Further, aggregate-level data are only available by MSA, which cover broad geographical areas within which are multiple communities. While communities within the identified geographical areas may not be expected to vary significantly, some local variation is expected that could significantly influence participation in environmental activities. However, few studies have attempted to examine the role of aggregate measures in environmental behaviors using a multi-level approach and the GSS is one of the few publicly available datasets that accommodates multi-level methodology.

Finally, the results hint at regionality of environmental issues. It is not unexpected that specific environmental issues may be of greater concern in particular geographic areas. For example, ocean and beach pollution may be viewed as a problem by coastal areas but not by residents of inter-continental areas. Further, sunbelt areas, which have experienced major population growth over the last couple of decades may react differently to the environmental problems of urban sprawl than other areas of the country. A plethora of other regional characteristics may coalesce to produce synergistic influences for both environmental quality and, in turn, environmental behaviors. Pollution levels vary by region depending on several characteristics that may, in and of themselves, play a role in determining environmental actions. Community environmental quality depends upon industrial composition, sources of pollution, geographical features of the landscape, the season of the year, and atmospheric conditions. For instance, patterns of wind conditions influence air quality levels, rotation of crops influence the use of pesticides, and seasonal climatic changes affect pollution concentration levels. Opportunities to act environmentally may also vary according to type of community services available, transportation systems, availability of land for community farming projects, or environmental education programs. All these factors differ not only by region but by state, county, and city. Thus, because of the potential variability of environmental problems and opportunities among areas of the country and the multitude of factors that play a role in environmental quality, defining region on a smaller scale than the four census regions warrants closer examination.

A society's quality of life is dependent not only upon the production processes that may negatively impact the quality of the environment, but also upon individual choices to act environmentally responsible. This examination has elucidated the role of individual, environmental, and community characteristics in the varied environmental responses of individuals. The results help to bridge the disjuncture between the function of individual attributes and the role of community phenomena in understanding the characteristics of the environmentally active and what gives rise to environmentally sensitive behaviors. While this research has successfully achieved its goal and has contributed significantly to the understanding of environmental behaviors, the results are also raise new questions about the individual decision-making process regarding the environment that warrant examination.

Only by understanding the influences on individual behavior can community level programs may be developed that address the negative impact of individual behavior on environmental quality. This examination of the larger social context enhances our understanding of who exhibits environmentally sensitive behavior, why they partake in environmental actions, and how to address environmental problems through social change. By changing individual behavior, the larger social processes that contribute to environmental negativity also will be forced to change to conform with the demands made at the individual level. The outcome will be improved environmental quality and a superior quality of life for all.

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APPENDIX A

CORRELATION MATRICES

Table 28: Correlation Matrix: Environmentally Sensitive Food Consumption Behaviors, Attitudes about Pesticides in Food, and MSA Characteristics – 1993 (N=1267)

		Environmentally Sensitive Food Consumption Behaviors	Attitudes-Pesticides in Food	Percent-MSA Population with a College Education	Northeast Region	Midwest Region	West Region	South Region	Proportion-Total MSA Acres Treated for Weeds
Environmentally Sensitive Food Consumption Behaviors	Pearson Correlation	1	.266**	.106**	.042	-.033	.077**	-.072*	-.048
	Sig. (2-tailed)		.000	.000	.132	.244	.006	.010	.087
Attitudes-Pesticides in Food	Pearson Correlation	.266**	1	.024	.013	.002	.065*	-.070*	.005
	Sig. (2-tailed)	.000		.392	.647	.936	.021	.013	.852
Percent-MSA Population with a College Education	Pearson Correlation	.106**	.024	1	.143**	-.177**	.329**	-.243**	-.292**
	Sig. (2-tailed)	.000	.392		.000	.000	.000	.000	.000
Northeast Region	Pearson Correlation	.042	.013	.143**	1	-.290**	-.256**	-.341**	-.259**
	Sig. (2-tailed)	.132	.647	.000		.000	.000	.000	.000
Midwest Region	Pearson Correlation	-.033	.002	-.177**	-.290**	1	-.314**	-.417**	.639**
	Sig. (2-tailed)	.244	.936	.000	.000		.000	.000	.000
West Region	Pearson Correlation	.077**	.065*	.329**	-.256**	-.314**	1	-.369**	-.307**
	Sig. (2-tailed)	.006	.021	.000	.000	.000		.000	.000
South Region	Pearson Correlation	-.072*	-.070*	-.243**	-.341**	-.417**	-.369**	1	-.112**
	Sig. (2-tailed)	.010	.013	.000	.000	.000	.000		.000
Proportion-Total MSA Acres Treated for Weeds	Pearson Correlation	-.048	.005	-.292**	-.259**	.639**	-.307**	-.112**	1
	Sig. (2-tailed)	.087	.852	.000	.000	.000	.000	.000	

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Table 29: Correlation Matrix: Environmentally Sensitive Automobile Use Behaviors, Attitudes about Automobile Produced Air Pollution, and MSA Characteristics – 1993 (N=1267)

		Environmentally Sensitive Automobile Use Behaviors	Attitudes-Automobile Produced Air Pollution	Percent-MSA Population with a College Education	Northeast Region	Midwest Region	West Region	South Region	Proportion-Days Air Quality Unhealthy
Environmentally Sensitive Automobile Use Behaviors	Pearson Correlation	1	.216**	.148**	.017	-.115**	.239**	-.116**	.029
	Sig. (2-tailed)		.000	.000	.542	.000	.000	.000	.295
Attitudes-Automobile Produced Air Pollution	Pearson Correlation	.216**	1	.107**	.028	-.062*	.108**	-.061*	.017
	Sig. (2-tailed)	.000		.000	.319	.028	.000	.031	.557
Percent-MSA Population with a College Education	Pearson Correlation	.148**	.107**	1	.143**	-.177**	.329**	-.243**	-.199**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
Northeast Region	Pearson Correlation	.017	.028	.143**	1	-.290**	-.256**	-.341**	-.077**
	Sig. (2-tailed)	.542	.319	.000		.000	.000	.000	.006
Midwest Region	Pearson Correlation	-.115*	-.062*	-.177**	-.290**	1	-.314**	-.417**	-.100**
	Sig. (2-tailed)	.000	.028	.000	.000		.000	.000	.000
West Region	Pearson Correlation	.239**	.108**	.329**	-.256**	-.314**	1	-.369**	.147**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000
South Region	Pearson Correlation	-.116**	-.061*	-.243**	-.341**	-.417**	-.369**	1	.029
	Sig. (2-tailed)	.000	.031	.000	.000	.000	.000		.301
Proportion-Days Air Quality Unhealthy	Pearson Correlation	.029	.017	-.199**	-.077**	-.100**	.147**	.029	1
	Sig. (2-tailed)	.295	.557	.000	.006	.000	.000	.301	

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 30: Correlation Matrix: Environmental Activism Behaviors, Attitudes about Environmental Regulation, and MSA Characteristics – 1993 (N=1267)

		Environmental Activism Behaviors	Attitudes-Environmental Regulation	Percent-MSA Population with a College Education	Northeast Region	Midwest Region	West Region	South Region	Proportion-Days Air Quality Unhealthy
Environmental Activism Behaviors	Pearson Correlation	1	.168**	.206**	.097**	-.043	.052	-.086**	-.092**
	Sig. (2-tailed)		.000	.000	.001	.124	.064	.002	.001
Attitudes-Environmental Regulation	Pearson Correlation	.168**	1	.115**	.077**	-.025	.012	-.052	-.062*
	Sig. (2-tailed)	.000		.000	.006	.368	.661	.064	.026
Percent-MSA Population with a College Education	Pearson Correlation	.206**	.115**	1	.143**	-.177**	.329**	-.243**	-.199**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
Northeast Region	Pearson Correlation	.097**	.077**	.143**	1	-.290**	-.256**	-.341**	-.077**
	Sig. (2-tailed)	.001	.006	.000		.000	.000	.000	.006
Midwest Region	Pearson Correlation	-.043	-.025	-.177**	-.290**	1	-.314**	-.417**	-.100**
	Sig. (2-tailed)	.124	.368	.000	.000		.000	.000	.000
West Region	Pearson Correlation	.052	.012	.329**	-.256**	-.314**	1	-.369**	.147**
	Sig. (2-tailed)	.064	.661	.000	.000	.000		.000	.000
South Region	Pearson Correlation	-.086**	-.052	-.243**	-.341**	-.417**	-.369**	1	.029
	Sig. (2-tailed)	.002	.064	.000	.000	.000	.000		.301
Proportion-Days Air Quality Unhealthy	Pearson Correlation	-.092**	-.062*	-.199**	-.077**	-.100**	.147**	.029*	1
	Sig. (2-tailed)	.001	.026	.000	.006	.000	.000	.301	

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Table 31: Correlation Matrix: Environmental Activism Behaviors, Attitudes about Environmental Regulation, and MSA Characteristics – 2000 (N=1152)

		Environmental Activism Behaviors	Attitudes-Environmental Regulation	Percent-MSA Population with a College Education	Northeast Region	Midwest Region	West Region	South Region	Proportion-Days Air Quality Unhealthy
Environmental Activism Behaviors	Pearson Correlation	1	.180**	.152**	.070*	.028	.049	-.125**	-.075*
	Sig. (2-tailed)		.000	.000	.018	.349	.095	.000	.011
Attitudes-Environmental Regulation	Pearson Correlation	.180**	1	.013	-.045	-.014	.041	.017	.011
	Sig. (2-tailed)	.000		.655	.123	.629	.166	.555	.711
Percent-MSA Population with a College Education	Pearson Correlation	.152**	.013	1	.221**	-.085**	.177**	-.258**	.037
	Sig. (2-tailed)	.000	.655		.000	.004	.000	.000	.209
Northeast Region	Pearson Correlation	.070*	-.045	.221**	1	-.292**	-.253**	-.374**	.068*
	Sig. (2-tailed)	.018	.123	.000		.000	.000	.000	.022
Midwest Region	Pearson Correlation	.028	-.014	-.085**	-.292**	1	-.283**	-.420**	-.147**
	Sig. (2-tailed)	.349	.629	.004	.000		.000	.000	.000
West Region	Pearson Correlation	.049	.041	.177**	-.253**	-.283**	1	-.363**	.086**
	Sig. (2-tailed)	.095	.166	.000	.000	.000		.000	.003
South Region	Pearson Correlation	-.125**	.017	-.258**	-.374**	-.420**	-.363**	1	.004
	Sig. (2-tailed)	.000	.555	.000	.000	.000	.000		.900
Proportion-Days Air Quality Unhealthy	Pearson Correlation	-.075*	.011	.037	.068*	-.147**	.086**	.004	1
	Sig. (2-tailed)	.011	.711	.209	.022	.000	.003	.900	

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed)

APPENDIX B

MSAS BY REGION

Table 32: MSA/County by Region – 1993 (N=91)

MSA/County	1980 Sampling Frame	1990 Sampling Frame
Midwest		
Burke County, ND		X
Cape Girardeau County, MO	X	
Chicago	X	X
Cincinnati		X
Columbus	X	
Crow Wing County, MN		X
Dayton	X	
Detroit	X	X
Eau Claire		X
Grand Rapids	X	
Indianapolis		X
Jackson		X
Kansas City		X
Lawrence County, IN		X
Milwaukee	X	
Minneapolis-St. Paul	X	X
Phillips County, KS	X	
Riley County, KS		X
Saginaw-Bay City	X	X
St. Louis	X	X
Sanilac County, MI	X	
Starke County, IN	X	

Table 32: MSA/County by Region – 1993 (continued)

MSA/County	1980 Sampling Frame	1990 Sampling Frame
Northeast		
Albany-Schenectady-Troy	X	
Atlantic City	X	
Boston	X	X
Burlington		X
Buffalo		X
Franklin County, NY		X
Franklin County, PA		X
New Haven	X	
New York	X	X
Philadelphia	X	X
Pittsburgh	X	X
Rochester		X
Schuyler County, NY	X	
Windham County, VT		X
Worcester		X
York		X

Table 32: MSA/County by Region – 1993 (continued)

MSA/County	1980 Sampling Frame	1990 Sampling Frame
South		
Atlanta	X	X
Baltimore	X	X
Bedford County, TN	X	
Bulloch County, GA	X	
Charleston	X	
Charlotte-Gastonia		X
Choctaw County, AL		X
Copiah County, MS		X
Crenshaw County, AL	X	
Cumberland County, KY		X
Dallas-Ft. Worth	X	X
Edgecombe County, NC		X
Enid		X
Ft. Lauderdale		X
Ft. Myers-Cape Coral		X
Greene County, TN		X
Hickory-Morganton		X
Hopkins County, TX		X
Houston	X	X
Jackson	X	
Jacksonville	X	
Johnson City-Kingsport-Bristol	X	
Knoxville	X	X
Memphis		X
Miami	X	
Monroe County, AR	X	
Montgomery County, VA	X	
New Orleans		X
Norfolk-Virginia Beach-Newport News		X
Oklahoma City	X	
Richmond-Petersburg		X
Robeson County, NC	X	
Sussex County, DE		X
Tampa-St. Petersburg-Clearwater		X
Waco	X	X
Washington, DC	X	X
Wheeling	X	

Table 32: MSA/County by Region – 1993 (continued)

MSA/County	1980 Sampling Frame	1990 Sampling Frame
West		
Alamosa Costillo County, CO	X	
Alpine County-El Dorado County, CA	X	
Bellingham		X
Boulder		X
Denver	X	X
Eugene-Springfield	X	
Los Angeles	X	X
Mesa County, CO		X
Phoenix		X
Portland	X	
San Diego	X	X
San Francisco-Oakland-San Jose	X	X
Santa Barbara		X
Seattle		X
Tucson		X
Wasco County, OR		X

Table 33: MSA/County by Region – 2000 (N=100)

MSA/County - Midwest
Allegan County, MI
Barry County, MO
Burke County, ND
Chicago
Cincinnati
Cleveland
Columbus
Crow Wing County, MN
Detroit
Eau Claire
Evansville
Ft. Wayne
Indianapolis
Jackson
Kansas City
Lansing
Lawrence County, IN
Lee County, IL
Minneapolis-St. Paul
Rapid City
Riley County, KS
Saginaw-Bay City
Sandusky County, OH
Springfield
St. Louis
Waushara County, WI

Table 33: MSA/County by Region – 2000 (continued)

MSA/County - Northeast
Allentown-Bethlehem-Easton
Boston
Buffalo
Burlington
Franklin County, NY
Franklin County, PA
New Haven
New York
Philadelphia
Pittsburgh
Rochester
Syracuse
Windham County, CT
Windham County, VT
Worcester
York

Table 33: MSA/County by Region – 2000 (continued)

MSA/County - South
Atlanta
Austin
Baltimore
Birmingham
Caroline County, VA
Chambers County, TX
Charleston
Charlotte-Gastonia
Choctaw County, AL
Copiah County, MS
Corpus Christi
Cumberland County, KY
Dallas-Ft. Worth
Edgecombe County, NC
Enid
Floyd County, GA
Ft. Lauderdale
Ft. Myers-Cape Coral
Greene County, TN
Hickory-Morganton
Hopkins County, TX
Horry County, SC
Houston
Iredell County, NC
Knoxville
Lynchburg
Memphis
Miami
Nashville
New Orleans
Norfolk-Virginia Beach-Newport News
Oklahoma City
Richmond-Petersburg
St. Landry Parish LA
Sussex County, DE
Tampa-St. Petersburg-Clearwater
Waco
Washington, DC
West Palm Beach-Boca Raton
Wilmington

Table 33: MSA/County by Region – 2000 (continued)

MSA/County - West
Anchorage
Bellingham
Boulder
Coconino County, AZ
Denver
Los Angeles
Mesa County, CO
Modesto
Phoenix
Pueblo County, CO
Richland County, MT
San Diego
San Francisco-Oakland-San Jose
Santa Barbara
Seattle
Tacoma
Tucson
Wasco County, OR