

# Homeowner Attitudes and Practices Towards Residential Landscape Management in Ohio, USA

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**Abstract** This study describes the results of a survey of 432 homeowners in Ohio, USA concerning their perceptions and practices regarding management of residential landscapes. The results reveal that outdoor residential environments are extremely important to homeowners, who tend to view their yards as serving multiple functions: a place to observe nature and to socialize as well as a place of beauty and recreation. Use of a lawn care company to apply chemicals is reported by 22 % of respondents, while 40 % either apply chemicals themselves or have someone other than a lawn care company do it. Logistic regressions reveal that factors influencing a homeowner's decision to employ a lawn care company or to apply chemicals themselves include: household income (+), perceived impacts on the environment (−), whether the next door neighbor does it (+), and type of residential environment (rural −, suburban and urban +). A theme that emerges throughout the study is the perceived importance of the role of the lawn in residents' sense of social status or acceptance in the neighborhood. This perception can be viewed as a positive in ensuring that residential environments are well maintained, but also as a negative resulting in

environmental degradation or presenting a barrier to creativity in the development of alternative residential environments. Specific policy implications of these findings are that efforts aimed at educating homeowners about the environmental impacts of their lawn care choices are likely to have more success if they are directed at neighborhood groups rather than individuals, show that alternatives are easy to adopt, affordable, and can produce the characteristics of lawns that homeowners seek.

**Keywords** Lawn care · Residential · Landscape management · Logistic regression

## Introduction

Maintenance and development of residential landscapes are important activities for millions of American homeowners. The “lawn” is an icon in American culture, borne of the vision of the English manor home and its pastoral estate, combined with the Jeffersonian ideal of universal individual ownership of land (Jenkins 1994; Teyssoit 1999; Steinberg 2006). Since its earliest promulgation by landscape architects in the late 19th century, the American lawn has been advocated as a source of both individual and collective social good (Downing 1844; Fein 1972; Schroeder 1993), accommodating these two different traditions and goals by providing a territorial illusion for the individual homeowner, while also creating a unifying “green canvas” that produces a visual sense of community. For the vast majority of Americans who own homes, therefore, residential lawns are understood simultaneously to represent an important economic investment, to signal social commitment, and to reflect personal character (Larson and Harlan 2006).

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Taking care of the lawn is partly an investment in capital, since homes typically represent homeowners' largest financial or economic assets, providing a strong incentive to invest time and money into lawn upkeep (Robbins and others 2001). As yards that "run wild" may lower the value of not only that property, but also neighboring ones, lawn care decisions are subject to strong normative pressures to uphold community standards (Robbins and Sharp 2003b). Failure to maintain lawns typically leads to legal sanctions maintained through deeds, covenants, and homeowner association enforcement mechanisms (Martin and others 2003; Rappaport 1992; Robbins 2007), and poor lawn care is often socially associated with poor character. Homeowners realize that the exterior of the home is all that most people will see, and the appearance of the exterior allows people to formulate "first impressions" which in large part determine how they perceive the homeowner. In a study by Harris and Brown (1996), observers were able to infer homeowners' commitment to their locale by observing the exteriors of their homes; two of the four most cited cues were yard maintenance and quality of lawn. Thus, lawns can be seen as a public expression of a person's character and values. People may use their lawns to demonstrate expertise, care, and social status, as well as simply their desire to be good citizens and neighbors by upholding community norms (Larson and others 2009a, b; Nassauer 1988; Robbins and Sharp 2003a).

The focus on the lawn as a reflection of character, and the increase in standards accompanying technological advances (Steinberg 2006) have led to dramatic growth in both the extent of lawn coverage and the suite of available inputs for lawn maintenance, especially chemicals employed to kill weeds and insects and to promote the growth of plants, primarily grass species that are considered desirable. Cultivated turfgrass covers 163,800 km<sup>2</sup> in the continental United States, making it the nation's largest irrigated crop (Milesi and others 2005). Coverage of turfgrass across the United States has continued to increase in recent decades, as most new houses dedicate significant proportions of the lot to lawns. Chemical usage on this vast and growing landscape is common; out of approximately 90 million US households, 66 million have lawn chemicals applied to manage their lawns and gardens (Butterfield 2004). Moreover, homeowners typically apply higher rates of chemical inputs per hectare than their agricultural counterparts (Robbins and Birkenholtz 2003).

As the use of lawn chemicals has increased, so has the controversy surrounding them. Turfgrass lawns provide a range of environmental and social benefits. These include: carbon sequestration; mitigation of urban heat island effects; protection, restoration, and improvement of soil; fire reduction; accelerated ground water recharge; organic

chemical decomposition; noise abatement and glare reduction; air pollution reduction, improvement in physical and mental health of residents; promotion of neighborhood cohesion; crime reduction; reduction of physical injury to children; and reduction of noxious pests and human disease exposure (Beard and Green 1994; Grewal 2007). But concerns about the efficacy of lawn treatments (Alumai and others 2009a, b) as well as their impacts on the health of residents (Guerreo 1990; Lewis and others 1994; Nishioka and others 1996; Zartarian and others 2000) and impacts on the environment (Watson and Baker 1990; Potter 1994; United States Geological Survey 1999; King and Balogh 2001; Grewal 2012) have emerged. Some studies on environmental impacts of turfgrass lawns suggest that, depending on their treatment, lawns may contribute to water quality degradation (King and Balogh 2001). Drift, volatilization, and tracking of lawn chemicals into homes have been demonstrated, with implications for unwanted exposure (Nishioka and others 1996). With an increase in available information of potential hazards of lawn inputs, there has been a concomitant acknowledgment by consumers about the potential impacts of their behaviors and land management strategies (Mechenich and Shaw 1994). Other studies have indicated that changing the knowledge, opinions and behaviors of homeowners with respect to landscape management presents a serious challenge (Hostetler and Noiseux 2010; Youngentob and Hostetler 2005; Askew and McGuirk 2004; Dunlap and Jones 2003). There has also been an increase in interest in the development and implementation of environmentally friendly residential landscaping practices (Bormann and others 1993; Feagan and Ripmeester 1999; Wasowski and Wasowski 2000; Yabiku and others 2008; Hostetler and Drake 2009; Alumai and others 2009a; Cheng and others 2008, 2010; Grewal 2012).

This research has come about amidst legal and regulatory efforts to curb unnecessary or excessive use of inputs, with proliferating policy mechanisms geared towards changing homeowner behavior. In Canada, notably, numerous cosmetic pesticide bans at the municipal scale have been adopted since 2000 (Lawn and Landscape Magazine 2001). These have had a demonstrable impact on levels of application and selection of natural alternatives (Cole and others 2011; Grewal 2012). In the United States context, however, such blanket bans are less legally and socially feasible, and attention instead has turned towards elements of the regulatory environment that allow consumers to "opt out" of intensive lawn use and pursue alternative landscaping (Rappaport 1992, 1993). The viability of these efforts and the targeting of their associated incentives depend on the degree to which homeowners view their behaviors as problematic, the degree of social influence from neighbors, and the importance of

pre-existing environmental commitments, among other factors. It is unclear, for example, whether it is more efficient and effective to target individuals (i.e., households) or communities (i.e., homeowner associations), or whether to rely on specific demographics (e.g., better educated homeowners) and political affiliations (e.g., environmentalism) or to promote education and reform across demographic cohorts. Targeting meaningful regulatory reform, therefore, requires a coherent model of homeowner decision-making surrounding chemicals and their application.

Yet, systematic analyses of homeowners' beliefs, practices, and concerns regarding residential lawn and landscape practices are not common (Zhou and others 2008). A previous national survey of consumer behavior suggests that chemical usage is associated with income, housing value, and education (Robbins and Sharp 2003a). Homeowners have been shown to apply lawn chemicals despite acknowledging risks and anxieties about their use (Robbins 2007), and due to time constraints associated with using alternatives (Templeton and others 1998). Clayton (2007) surveyed a non-representative sample of visitors to a garden center concerning their attitudes and practices. In this group, she found that gardeners were motivated by two different types of benefits from their yards: providing a place to observe and enjoy nature and a place that enables social interactions with family and neighbors. These uses are not incompatible with each other, and both types of use were positively associated with satisfaction with the yard. Factors affecting the practices used in caring for the yard, from most to least important, were: colorful appearance, safety, reducing or eliminating weeds, maintaining a healthy ecosystem, enhancing property value, ease of maintenance, demonstrating care for yard, minimizing resource use, low cost, using native plants, and meeting neighborhood standards. Among these dedicated gardeners, appearance-related concerns were predominant, but property value and the way in which others perceived the yard were still important. Using the yard to enjoy nature, however, was negatively associated with attention to practical considerations such as cost and ease. This suggests that some consumers care about the ecological health of their yards, but these may be a different group from those who are primarily motivated by convenience.

The emerging picture of consumer lawn care is complex. Consumers are simultaneously concerned about chemicals but driven to use them; they seek individual safety but pursue community benefits; they are concerned about costs, but also about personal commitments of time and labor. Lawn consumers are, in short, ambiguous figures. The results of previous research are suggestive, therefore, and point to a great deal that remains unknown in the realm of consumer behavior and attitudes regarding lawn chemicals and related landscape practices.

Specifically, it remains essential to query (1) the degree to which chemical users differ from non-users in their environmental concern, (2) the role and influence of community and neighbors both on perceptions, as well as uses, of chemicals. In order to add to our knowledge about lawn care practices among a more representative sample, we undertook a survey designed to elicit a very wide range of behaviors and opinions of homeowners across a state in the Midwestern USA thought to be in the American mainstream regarding these issues. Ohio homeowners represent an important group for test marketing lawn and landscape products and services. A number of major lawn and landscape companies including the Scotts Company, TrueGreen, ChemLawn, the Davey Tree Company, the Andersons, Lesco, Inc., and Machine Tools and Dye Company were originally founded and still headquartered in Ohio.

The specific objectives of this study were to (1) describe homeowner attitudes and behaviors regarding application of chemicals to residential landscapes, (2) profile behaviors associated with chemical use by way of a set of demographic and value-based variables, and (3) draw policy implications and suggestions for environmental management.

## Methods

### Procedure

We utilized a phone list of a random sample of Ohio residents. Telephone interviews were conducted by the Scripps Survey Research Institute. In order to obtain a sample that satisfies minimal requirements to provide sampling error within  $\pm 5\%$ , we needed to have 384 completed surveys (Krejcie and Morgan 1970). Our final sample contained 432. In order to take into account unlisted phone numbers, each time an interviewer phoned a number on the list, (s)he followed that call by a number that was different from the first by arbitrarily changing the last two digits of the number (Dillman 1978). Initially, each respondent was asked whether her (his) home included a lawn. For those who answered no, this constituted the end of the interview. For those with lawns, the interview proceeded. We did not keep records of refusals or the numbers of people who could not be reached. Therefore, non-response bias could not be estimated. Instead, the focus of the method was to obtain a sample of sufficient size to allow for a sampling error of less than 5%. Interviewers informed respondents that the survey was being conducted by the Ohio State University for research purposes, that respondents' names would not be associated with any answers or survey information, and that results of the survey would be available upon request. Each interview lasted about approximately 15 min.

## Survey

The survey had three sections labeled: Attitudes, Practices, and Demographics. The first section included questions assessing respondents' perceptions about lawn chemicals, as well as the ways in which they use their yards, their satisfaction with its appearance, and their neighbors' use of lawn chemicals or of lawn care companies. In this section, we focused on one dimension of the tripartite attitudinal model conceptualized by Larson and others (2011)—*cognitive* judgments. Cognitive judgments encompass knowledge as well as subjective beliefs and ideas, in this case about environmental problems and their causes and solutions (Dunlap and Jones 2002), but do not inherently imply personal worry or emotional attachment (*affective* judgments or emotional concerns) to an issue or reflect what ought to be done about the problem (*conative* judgments or policy attitudes). In attempting to obtain a measure for this attitudinal construct, we asked whether respondents believed lawn care applications had a variety of positive or negative effects on their home values, neighborhood or the environment.

The second section questioned respondents about their actual lawn care practices, including the reasons for those practices, i.e., the values that underlay their lawn care decisions. First, this section included questions about the time spent by respondents on maintaining their yard, whether they employed a lawn care company, and whether someone else applied lawn chemicals on their behalf or they applied chemicals themselves. This section also sought information from respondents about their knowledge of the types, quantity, and frequency of lawn chemicals they, lawn care companies, or someone else applied to their lawns, their top two sources of information about lawn management, and neighborhood legislation restricting any lawn management practices. Respondents were also asked to rate their reasons and motivations for choosing specific landscape management practices on the basis of ease, financial, community, safety, and ecological concerns. In this way, we evaluated the values that might translate the *cognitive* judgments assessed in the first part of the study into more *affective* judgments, representing the second dimension of the conceptual model used by Larson and others (2011). Finally, respondents were asked to indicate their agreement or disagreement about their reasons for not replacing their lawn with another ground cover based on fit into the look of the neighborhood, cost, and ease of care.

The third and final section of the survey measured respondents' demographic information including their age, gender, education level, and annual household income. The survey appears in its entirety in Appendix I.

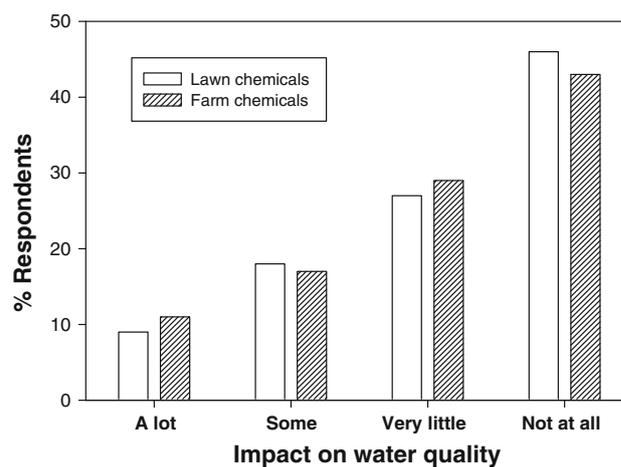
## Data Analysis

We analyzed data using Statistical Package for the Social Sciences (SPSS) software. Virtually the entire survey consisted of close-ended questions, where respondents were requested to answer within categories which included dichotomous choice, anchored Likert scales and other multiple category responses. Initially, we examined simple frequencies on responses. We then undertook a series of bi-variate analyses which consisted of cross-tabs evaluated statistically by use of Chi square. The final portion of the data analysis was conducted by multiple logistic regression.

## Results and Discussion

### Part I: Attitudes

Initially we asked respondents to give their views on the impacts of lawn chemicals on local water quality. In order to provide a context for comparison, we asked them the same question about farm chemicals. The results presented in Fig. 1 reveal that, although perceptions about lawn and farm chemicals vary greatly among respondents, there is no statistical difference between the two sets of responses—indicating that respondents' cognitive judgments towards environmental impacts of lawn chemicals are similar to those associated with farm chemicals. A total of 9 % of respondents rated the influence of chemical runoff from lawns on water quality as a "lot" and another 18 % rated it as "some," while 27 % believed that lawn chemicals affect water quality "very little," and the remainder (46 %) "not at all." In light of previous research summarized in the

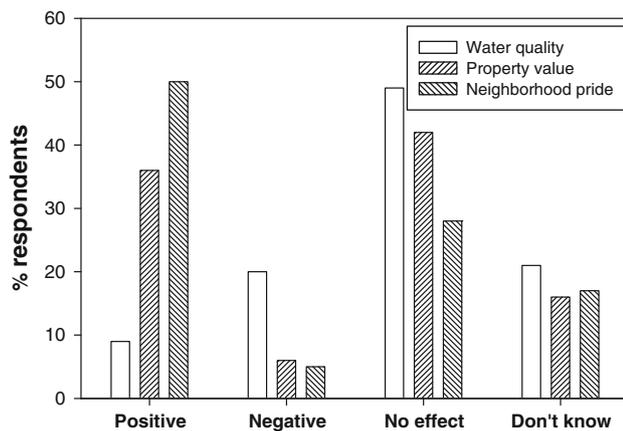


**Fig. 1** Homeowner's perceived impacts of lawn and farm chemicals on water quality. Data are percentages of respondents ( $n = 432$ )

introduction section on this topic, these results suggest that educating homeowners about the impacts of lawn chemicals on water quality may be an appropriate starting point for those concerned about the issue of environmental consequences of lawn management practices.

Next, respondents were asked questions about the lawn care practices of their next door neighbor, as well as a series of questions about the effects of these practices on three aspects of community: environmental (as measured by water quality), economic (as measured by property values), and social (as measured by community pride). The intention of querying perceptions of neighbor's behavior was to evaluate the role of peer example and pressure in lawn management decision-making (Nielson and Smith 2005). A total of 24 % of respondents stated that their next door neighbor (on the property to their right—to avoid confusion and maintain consistency) hired a lawn care company to spray chemicals. A total of 27 % said the neighbor applied chemicals to the lawn themselves. The results for the perceived impacts of neighbors' lawn care applications are presented in Fig. 2. Most respondents state that they are either unaware of the impacts of their neighbor's practices on water quality or that the impacts are none. Of those who believe that there is an effect, the negatives outweigh the positives by 2-1 (20 vs 9 %). On the other hand, of those who believe that neighbor's practices influence property values, there is a 6-1 (36–6 %) ratio in favor of positive impacts of lawn care applications on property values—and a 10-1 (50–5 %) ratio on the positive impact on neighborhood pride.

The results in Table 1 reveal that the neighbor's use of a lawn care company is perceived to have a strong impact on water quality (–), property values (+) and neighborhood pride (+). However, the neighbor's own application of



**Fig. 2** Homeowner's perceived impacts of neighbor's lawn care practices on water quality, property values and neighborhood pride. Data are percentages of respondents. Percentages may not sum to 100 due to rounding

**Table 1** Homeowners' perceptions of the effects of neighbor's lawn application on community characteristics by type of chemical application

Characteristic	Type of application	
	Company	Self/other
Water quality	12.81**	3.84
Property value	6.87*	25.3***
Neighborhood pride	14.88**	32.61***

Numbers are  $\chi^2$  values

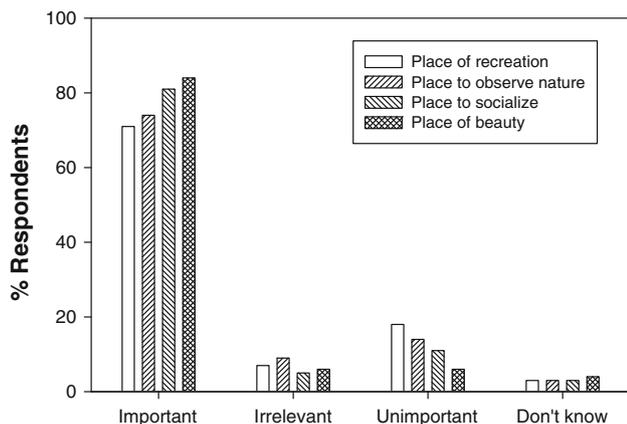
\*\*\* Statistically different from zero with  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$

lawn chemicals was not perceived to have an impact on water quality. A majority of those who state that their neighbor applies chemicals without a lawn care company believe that these applications have no effect on water quality. Moreover, neighbor's own application of chemicals is associated positively with property values and community pride. These results indicate that respondents believe that the application of lawn chemicals without the help of a lawn care company may provide similar benefits to those obtained by using a company, without as much negative environmental effect. These findings suggest negative public attitudes toward lawn care companies. Why homeowners tend to rank individual practices less harmful to the environment and more beneficial to their property values than those of the lawn care companies is interesting and well worth investigating.

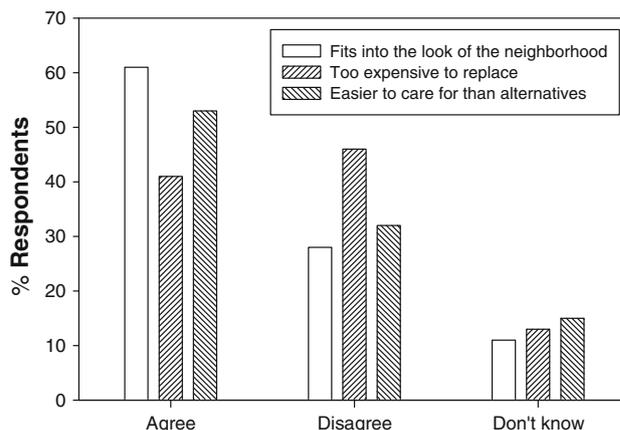
## Part II: Practices

Respondents were asked about the use of their yards. The results in Fig. 3 reveal that most respondents use their lawns/yards in a multi-dimensional manner: over 84 % say their yard is a place of beauty, 81 % say a place to socialize with friends, 74 % a place to observe nature, and 71 % a place for recreation. Although the results show that the large majority of respondents believe that all four dimensions of the lawn use are important, the rating on place of beauty is significantly greater than the rating for place of recreation ( $p < 0.05$ ). This suggests a preference for aesthetics—particularly visual aesthetics—over functionality.

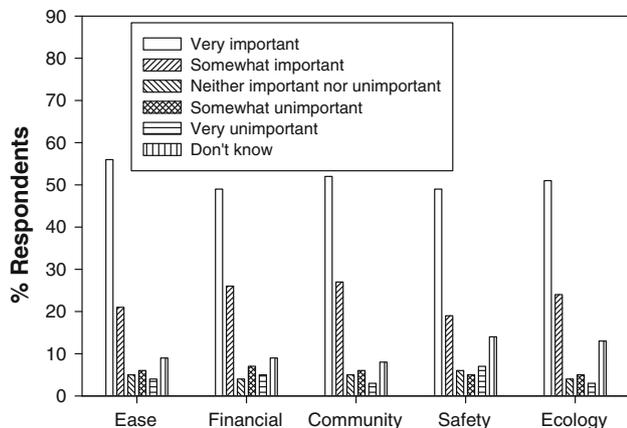
The next set of questions focused on the types of ground cover homeowners have and why they adopt the practices they do, including ease of maintenance, cost, impact on community and safety. Turfgrass remains the ground cover of choice among respondents, with a total of 38 % stating that all of their lawns are covered by it, while 40 % stating more than half, 12 % about half, and 5 % stating less than half of their lawn is covered by turfgrass. Still, a total of 40 % have replaced at least a portion of their lawns with



**Fig. 3** Homeowner's views of the utility of their yards. Data are percentages of respondents out of 432. Percentages may not sum to 100 due to rounding



**Fig. 5** Main reasons why homeowners keep the lawn rather than replacing it with another ground cover. Data are percentages of respondents



**Fig. 4** Relative importance of ease (my lawn care method is low cost and meets my time constraints), financial (my lawn care improves my property value), neighborhood (my yard care results improve my neighborhood), safety (my yard care method lowers the risk I face personally from chemicals and machinery), and ecology (my yard care method maintains a healthy ecosystem). Data are percentages of respondents

other kinds of cover, with the most popular alternatives being flowers and shrubs. Miscellaneous other forms accounted for 33 % of this change. Results in Fig. 4 indicate that ease, cost, neighborhood pride, safety and ecology are all important determinants of lawn care practices. The results particularly those on safety and ecology underscore the different emotional concerns (*affective* judgments) informing respondents' attitudes about the impact of chemicals on their health and the environment.

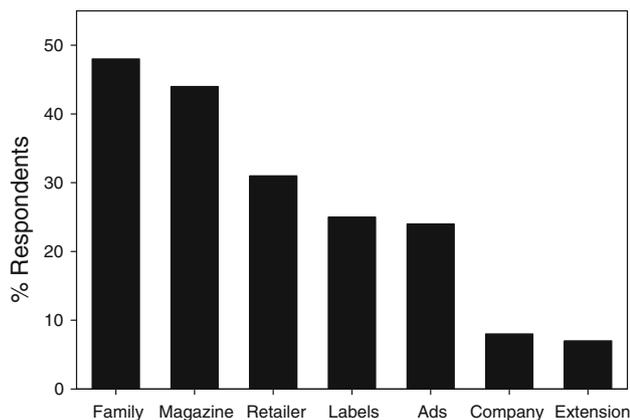
Given that ecology and safety are important, the obvious question is why do homeowners maintain a lawn which requires an intensive use of chemicals? The results in Fig. 5 show that although ease and cost are important factors in homeowners' decisions to keep their lawns,

neither of these considerations gets as much agreement as the desire that the lawn "fits in" with the general look of the neighborhood. This reinforces the theme throughout this study and found in some previous studies (Thompson 2004; Nielson and Smith 2005; Atwood and others 2007; Alumai and others 2009b) that a craving for acceptance in the neighborhood is a primary driver of people's lawn care practices. In general, these findings suggest that if homeowners are to change their ground cover, they will need to be convinced that alternative landscapes are socially acceptable in neighborhoods, are not too difficult to maintain, and that change is affordable.

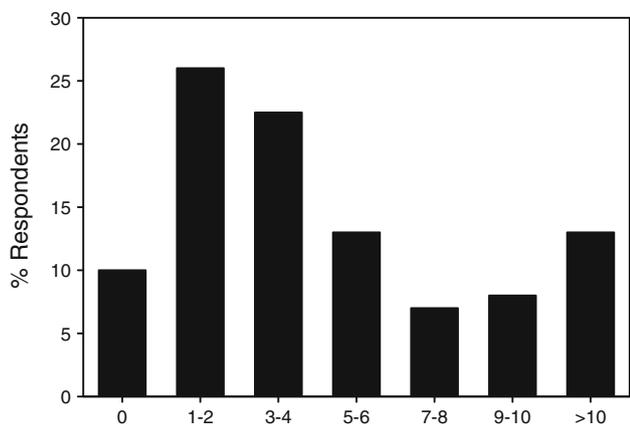
We asked respondents a series of questions concerning practices associated with managing their lawns. The results in Table 2 show that 22 % of respondents use a lawn care company. Note that the rate of personal or other applications (40 %) is nearly twice as common as hiring a lawn care company. The majority of the respondents reported that they obtain information about the landscape management from a relative (about 50 %), followed by a magazine (about 45 %) and a retailer (about 30 %) (Fig. 6). The most striking finding however is that less than 8 % of the respondents reported that they obtain information on landscape management from university Extension,

**Table 2** Percentages of homeowners that use a lawn care company or someone other than a lawn care company to apply lawn chemicals

Question/response	Yes	No
Last year, did a lawn care company apply any fertilizers, bug killers, or weed killers to your lawn?	22	78
Last year, did you or someone other than a lawn care company use any fertilizers, bug killers, or weed killers on your lawn?	40	60



**Fig. 6** Homeowners' sources of information about landscape management. Data are percentages of respondents



**Fig. 7** Time homeowners spend per week working in their yards. Data are percentages of respondents

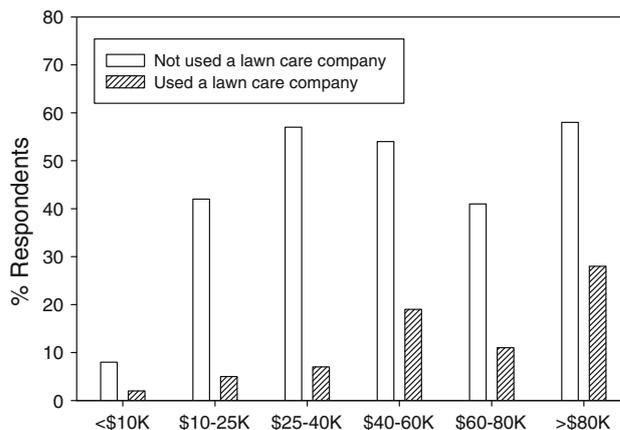
presenting a significant barrier for university research to reach homeowners through this method. Results in Fig. 7 show that on average homeowners spend 6 hours per week tending to their yards, with about 90 % spending at least one h/wk and over 42 % spending over 6 h/wk.

Part III: Demographics

The demographics information obtained from the respondents is summarized in Table 3. We obtained more responses from females (228) than males (192). The age distribution of respondents rises from the below 30 age group, peaks in the 40–49 cohort, and then descends as it approaches the cohorts that include senior citizens. The most common education level among respondents is college undergraduate, followed fairly closely by high school graduate. The median annual household income of respondents is in the \$40,000–\$60,000 category, which also includes median household family income for Ohio as well as the US (Bureau of the Census 2010).

**Table 3** Summary of demographic profiles of respondents

	Age	# of respondents
	<30	47
	30–39	69
	40–49	104
	50–59	93
	60–69	44
	70+	49
Gender	Male	192
	Female	228
Education	Level attained	# of respondents
	<High school grade	27
	High school grade	148
	College undergraduate	179
	Masters degree	49
	Ph.D, M.D., etc	12
Annual household income	Amount/annum	# of respondents
	<\$10 K	9
	\$10–\$25 K	47
	\$25–\$40 K	66
	\$40–\$60 K	74
	\$60–\$80 K	56
	>\$80 K	87



**Fig. 8** Relationship between household income and the use of a lawn care company. Data are percentages of respondents

Part IV: Factors Associated with Lawn Chemical Application

We utilized a variety of statistical procedures to identify and quantify factors associated with application of lawn chemicals in order to create a profile of those who do/do not. Initially we utilized a series of bi-variate ( $\chi^2$ ) tests. The most striking result is the association between use of a lawn care company and household income (Fig. 8). Use of a

lawn care company is highly related to household income. Less than 10 % of households with incomes below \$40,000 per year with lawns employ a lawn care company, while 28 % of those whose incomes exceed \$80,000 do. These results imply that use of a lawn care company is a luxury good/service for homeowners.

Next, we estimated two multivariate regression equations designed to profile (a) those who employ lawn care companies to apply chemicals and (b) those who applied chemicals themselves or had someone other than a lawn care company make the application. For each equation we used a multiple regression procedure (logistic) which specifies a dichotomous dependent variable as a function of a set of independent variables. The results of these analyses are reported below.

#### *Employ a Lawn Care Company to Apply Chemicals*

The results of the first equation presented in Table 3 show that a total of seven variables are statistically related to whether a household employs a lawn care company to apply chemicals. Women who responded are more likely than men to have reported use of a company. One possible explanation is that women who live in a home where no adult male is present may be more likely to hire a company to do the job than to undertake it themselves. As demonstrated in the bi-variate analysis, income plays an extremely important role in determining household use of a lawn care company in the multivariate context as well.

We used a zero to one dummy to describe what kind of community each household is in. In the original survey, respondents were presented with a four point alternative: large city, small city, suburb, or rural area. Initial bi-variate tests showed no significant differences between homeowners in the first three groups, so we coded each of the first three a zero and rural a one. The results demonstrate that rural residents are far less likely to employ a lawn care company than residents of the other three types of communities. We initially included each of the variables reported in Fig. 4 as regressors. Because there were relatively high degrees of associations between sets of these variables (multicollinearity), we eliminated the three variables which had the highest  $p$  values in the initial regression (ease, financial, and ecology;  $p > 0.25$ ) and re-estimated the equation. As shown in Table 4, the parameter estimate on neighborhood pride is positive, suggesting that the more important respondents believe their lawn care practices to be in improving their neighborhoods, the more likely they are to hire a lawn care company. This variable is moderately statistically related to some of the other remaining independent variables, and as a result, it only marginally receives statistical significance. The  $p$  value rounds to 0.1, but is technically slightly

**Table 4** Logistic regression: dependent variable—last year, did a lawn care company apply any fertilizers, bug killers, or weed killers to your lawn?

Independent variable	Parameter	Significance
Gender	0.76	0.04**
Income	−.35	0.01***
Rural	−1.27	0.01**
Neighborhood pride	0.36	0.10*
Safety	−0.31	0.02**
Application/environment	−3.22	0.00***
Neighbor uses	0.83	0.03**

Log Likelihood = 214.68, Cox and Snell  $R^2 = .17$ , Nagelkerke  $R^2 = .26$

\*\*\* Statistically different from zero at the 99 % level of confidence, \*\* 95 % level, \* 90 % level

above the cut-off point. Nevertheless, we believe that it is worth reporting—especially since we were not able to find a significant association between the dependent variable and the improvement of personal property values in the multivariate context. In other words, while many respondents believe that the use of a lawn care company may improve their property values, they appear to hire a lawn care company as much out of a sense of general neighborhood improvement as personal property value motives.

The results on the safety variable reveal that the perception that lawn chemicals are unsafe may be discouraging a significant portion of the population from using a lawn care company. The highly statistically significant negative parameter here provides evidence that those who are more safety conscious about their lawns are less likely to employ a lawn care company. This result may be a function of media attention given to negative effects of lawn chemicals on personal health and the environment, and may also reflect a distrust of lawn care companies. However, the findings also suggest that there is a segment of lawn owners who may be more likely to adopt non-chemical methods/programs such as biological control and organic lawn care for lawn management, corroborating findings reported by Butterfield (2004).

The next variable represents an algebraic manipulation of two separate variables in the data set: whether the homeowners apply the chemicals themselves and their attitudes about the impacts of lawn chemicals on the environment. These two variables are highly statistically related, so we could not specify them separately on the right hand side of the equation due to problems of multicollinearity. But as simple bi-variate analysis suggests that those who apply lawn chemicals themselves are less likely than others to hire a lawn care company, while those who believe that the negative environmental impacts of lawn

chemicals are high are also less willing to do so. The combination of these two variables into application/environment emerges as the most important explanatory variable in the equation, as measured by the magnitude of the parameter and the  $p$  value ( $-3.33$ ,  $p < 0.01$ ). Once again these results underscore the negative image of lawn care companies in terms of their impact on the environment.

The final variable in the regression is a zero to one dummy as to whether the respondent's neighbor uses a lawn care company. The positive and statistically significant parameter reveals either that those whose neighbors do in fact use a company are also more likely to do so, or that those who use a company themselves are more likely to assume that their neighbor does also. The results presented here reveal that in many ways, the use of a lawn care company is a luxury good driven to a very high degree by a craving for status in or for the community. People who live in more isolated areas are far less likely to use one. The portrait of a household that does use one is high income, whose neighbor does it, who is concerned about the quality of the neighborhood, and less concerned about environmental or safety impacts of chemical applications.

The results on environmental and safety concerns indicate that efforts to reduce lawn chemical use may require raising the awareness of adverse environmental and safety impacts of these chemicals. Moreover, since respondents who are concerned about these kinds of impacts are currently less likely to employ a lawn care company, the results suggest that there is a potential market for new kinds of lawn applications which can be shown to be safe and environmentally friendly. These appear to be among the biggest challenges both policy makers and the lawn care industry will face in the future. At the same time, the results reveal that the vast majority of homeowners are “in the dark” concerning what chemicals are being applied (88 %). It is quite likely that this lack of knowledge or unwillingness to know is an important part of what is driving consumer demand for professional lawn care services, since presumably homeowners believe that the expertise of the professionals is a portion of what they are paying for when they retain the services of these providers.

#### *Chemicals Applied by Self or Other*

The results of the second logistic regression equation are presented in Table 5. Note that there are important similarities between these regression results and the ones presented in Table 4, but there are some important differences as well. First, the magnitudes and levels of significance on the application/environment variable are virtually identical. In the previous equation, application was coded “1” if the person sprayed themselves or employed someone other than a lawn care company, and here it is a “1” if the person

**Table 5** Logistic regression: dependent variable—last year, did you or someone other than a lawn care company apply any fertilizers, bug killers, or weed killers to your lawn?

Independent variable	Parameter	Significance
Gender	0.23	0.45
Income	0.19	0.06*
Rural	-0.79	0.03**
Neighborhood pride	-0.06	0.71
Safety	0.09	0.49
Application/environment	-3.33	0.00***
Neighbor uses	0.40	0.27
Neighbor applies	1.36	0.00***

Log Likelihood = 267.44, Cox and Snell  $R^2 = .16$ , Nagelkerke  $R^2 = .21$

\*\*\* Statistically different from zero at the 99 % level of confidence, \*\* 95 % level, \* 90 % level

employed a lawn care company. Both are divided by the score on “environment”—the four point variable presented as the first question in the survey report. These results show an important symmetry that those who apply chemicals themselves are less likely to employ a lawn care company and vice versa but, there is in fact a small segment of homeowners that do both. Moreover there is some ambivalence here. Many respondents state that they are concerned about the impact of lawn chemicals on water quality, and in general, the higher that concern, the less likely they are to employ a lawn care company or apply chemicals themselves. And again, the magnitude of the association is statistically identical. However, in the case of this regression, unlike before, safety and neighborhood pride do not play a significant role. So while people are motivated by these factors when considering whether or not to employ a lawn care company, they do not seem to be motivated by these factors when it comes to deciding about applying chemicals themselves. The fact that respondents who are more concerned about safety are less likely to use a company but not less likely to apply chemicals themselves implies that there are a number of homeowners who either do not trust lawn companies, believe that lawn applications made by companies are less safe, or both.

Another symmetry that we find in this regression concerns the practices of neighbors. Here we find that there is no association between homeowners ‘doing it themselves’ and the neighbor’s use of a lawn care company, but a strong association with the neighbor who “does it themselves.” So we have important neighborhood patterns. People who believe that their neighbors use a lawn care company are more likely to do so (Table 4), and people who believe their neighbors “do it themselves” are more likely to follow suit that way also (Table 5). These results contribute to an understanding of the importance of the

sense of neighborhood in motivating homeowners in their choices regarding applications of chemicals to their lawns. Since the neighborhood pride variable plays a significant role in the first regression but not in the second we conclude that those who truly are craving status for the neighborhood are more likely to employ the lawn care company than those who “do it themselves.” Also as before, those with high incomes are more likely to use chemicals, while those in rural areas are less likely, other things being equal. Unlike before, gender plays no role. Although we only found half as many statistically significant variables as before the overall explanatory power of this regression is essentially the same as the earlier one, as measured by pseudo  $R^2$  (Cox and Snell 1968; Nagelkerke 1991) and log likelihood.

### Conclusions, Policy Implications and Suggestions for Further Research

The results of this study provide a suggestive profile of homeowners who use lawn chemicals, either by employing a lawn care company or by “doing it themselves.” The study’s contribution is in providing systematic insight not only to the behavior of homeowners toward their residential environments, but also about their perceptions, motivations, reservations and expectations concerning various practices. Lawns are valued as places of beauty and nature as well as places to recreate and socialize. Although homeowners presumably do not want to contaminate their local water supply, many appear not to consider the possible impact of their lawn chemicals on water resources and many do not even inquire as to what chemicals are being applied to their lawns by the companies they hire to do so. Those who do make the connection tend to direct their behavior accordingly, either spraying chemicals themselves or refraining from any kind of chemical application to their lawns. These results suggest that educating homeowners more about the potential impact of lawn chemicals on water quality could lead to changes in homeowners’ behavior. Unfortunately, university Extension is not a source of information that homeowners use for their decisions about landscape management practices, making the task of homeowner education difficult. Further, the sources of landscape management information that homeowners rely upon—a relative, magazine, or retailer—may be biased due to the influence of neighborhood on the relative or motivation of product producers or retailers to sell more product.

There are very high associations between the lawn care practices of homeowners and those of their neighbors. One of the best predictors of whether a respondent employs a lawn care company to apply chemicals, does it himself, or has an acquaintance do it is what the neighbor is believed

to do. The causal direction of this relationship is unclear—do people use a lawn care company because their neighbor does, or do they believe their neighbor does so because they themselves do? Either possibility, however, demonstrates the importance of the social context in interpreting the significance of particular practices. Similarly, residents are at least as concerned about improving the neighborhood when they make lawn care decisions as they are about improving their own personal property values, and appear to be more driven by the “neighborhood” factor than the personal property value factor when making the decision to employ a lawn care company. This is borne out by a number of statistics presented here, including the fact that rural residents are far less likely than others to use lawn chemicals of any kind.

While neighborhood status is a motivating factor in getting people to care for their landscapes, it can also be seen as a barrier to creativity and innovation, since homeowners are striving not necessarily just for quality but for acceptance and homogeneity. The leading reason people report for maintaining their current landscape is that it “fits in” well with the neighborhood (61 % as opposed to 53 % who cite ease and 41 % who cite financial reasons). Therefore, policy implications are twofold. First, these findings suggest that interventions and education directed at individuals may be ineffective if the practices of the collective or neighborhood are unchanged. This implies that convening forums for dialogue and reform amongst neighborhood and homeowner associations may be a useful precursor to individual decision-making change. Second, the results bode well for “opt out” forms of legislation—as implemented in municipalities like Madison, Wisconsin (Rappaport 1993). This policy allows one or two homes in a community to adopt certain forms of alternative landscaping - legislation that allows variety in landscaping practices may open the community-wide aesthetic to a consideration of diverse landscape options that can “fit into” the community landscape and develop a new community norm.”

Numerous important questions remain. Why do people overuse chemicals, or allow chemicals to be overused in their name? What sets apart those who engage in “natural” lawn care management from those who do not? Under what sets of circumstances can lawn care companies that use non-chemical practices succeed over those that do not? What does it take to move communal preferences away from chemical intensive turfgrass lawns and toward organic and non-chemical lawn care or to alternative ground covers? These questions need to be addressed in future research to better understand homeowner behavior and to design improved practices for residential landscape management.

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## APPENDIX 1. Questionnaire

### Questionnaire Part ONE: Attitudes

- (1) How much do chemicals from farms, such as fertilizers and weed killers, or bug killers affect water quality near your community? Would you say?
- <1> A LOT,  
<2> SOME,  
<3> VERY LITTLE, OR  
<4> NOT AT ALL
- (2) How much do chemicals from lawns, such as the use of fertilizers, weed killers, or bug killers applied to their yards affect water quality near your community? Would you say?
- <1> A LOT,  
<2> SOME,  
<3> VERY LITTLE, OR  
<4> NOT AT ALL
- (3) Does your nearest neighbor on your right hand side use a lawn care chemical company? Y/N or DN (Yes, No, or Do not know)
- (4) Does your nearest neighbor on your right hand side apply lawn chemicals (fertilizers/ weed killers, or bug killers) themselves? Y/N or DN
- (5) What kind of effect do you think that neighbors' lawn care applications have on water quality...
- <1> NEGATIVE EFFECT  
<2> NO EFFECT  
<3> POSITIVE EFFECT  
<4> DON'T KNOW
- (6) What kind of effect do you think that neighbors' lawn care applications have on your property values...
- <1> NEGATIVE EFFECT  
<2> NO EFFECT  
<3> POSITIVE EFFECT  
<4> DON'T KNOW
- (7) What kind of effect do you think their lawn care applications have on feelings of pride in your neighborhood ...
- <1> NEGATIVE EFFECT  
<2> NO EFFECT
- <3> POSITIVE EFFECT  
<4> DON'T KNOW
- Thinking about the ways in which you use your yard, how important is each of the following?
- (8) A place for recreation
- <1> Important  
<2> Neither important nor unimportant  
<3> Unimportant or not used in this way
- (9) A place to observe nature (e.g., birds, butterflies, other wildlife)
- <1> Important  
<2> Neither important nor unimportant  
<3> Unimportant or not used in this way
- (10) A place to socialize with friends
- <1> Important  
<2> Neither important nor unimportant  
<3> Unimportant or not used in this way
- (11) A place of beauty
- <1> Important  
<2> Neither important nor unimportant  
<3> Unimportant or not used in this way
- (12) How satisfied are you with the appearance of your yard this year?
- <1> Very satisfied  
<2> Somewhat satisfied  
<3> Neither satisfied nor unsatisfied  
<4> Somewhat unsatisfied or  
<5> Very unsatisfied
- (13) How satisfied are you with the appearance of the yard of your nearest neighbor on your right hand side?
- <1> Very satisfied  
<2> Somewhat satisfied  
<3> Neither satisfied nor unsatisfied  
<4> Somewhat unsatisfied or  
<5> Very unsatisfied
- (14) Have any of your neighbors ever commented on your yard? Y/N
- (14a) If so, was it a compliment or a concern? Comp/ Conc
- (15) When it comes to bugkillers, weedkillers, and fertilizers homeowners tend to apply:
- <1> Too much  
<2> The correct amount  
<3> Too little

(16) When it comes to bugkillers, weedkillers, and fertilizers, professional lawn care companies tend to apply:

- <1> Too much
- <2> The correct amount
- <3> Too little

#### Questionnaire Part TWO: Practices

Now I'd like you to think about some different lawn care practices. For all of these questions I want you to think of what you did this last year – May to August 2004.

(17) During this season, about how many hours a week do you spend working in your yard?

(ASK FOR BEST GUESS IF UNCERTAIN.)

(18) Last year, did a lawn care company apply any fertilizers, bug killers, or weed killers to your lawn?

- <1> YES, LAWN CARE COMPANY APPLIED CHEMICALS
- <0> NO, A LAWN CARE CO. DID NOT APPLY CHEMICALS

(18a) [If 18 YES] How many times did they come to your home to spray or apply any chemicals or treatments last year?

<1-87> \_\_\_\_\_ # OF TIMES

(18b) Do you know what chemicals were applied by this company? Y/N

(18c) [If 18b YES] Which chemicals were these?

(19) Last year, did you or someone other than a lawn care company use any fertilizers, bug killers, or weed killers on your lawn?

- <1> YES, APPLIED CHEMICALS TO LAWN
- <0> NO, DID NOT APPLY CHEMICALS TO LAWN

(19a) [If 19 YES] Did you use any fertilizer on your lawn last year?

- <1> YES, USED FERTILIZER
- <0> NO, DID NOT USE FERTILIZER

(19ai) [If 19a YES] About how many times last year did you apply fertilizer to your own lawn? Was it...

- <1> Once,
- <2> Twice,
- <3> Three times,
- <4> Four times, or
- <5> More than four times?

(19b) [If 19 YES] Did you use any insecticides or bug killer on your lawn last year?

- <1> YES, USED INSECTICIDES
- <0> NO, DID NOT USE INSECTICIDES

(19c) Did you use any herbicides or weed killers or did you use a weed and feed package last year?

- <1> YES, USED WEED KILLER
  - <0> NO, DID NOT USE WEED KILLER
- [goto q23a]

(20) Which of the following would you describe as your top TWO sources of information for yard management and the use of fertilizers, weed killers, or bug killers?

- <1> FAMILY MEMBERS
- <2> RETAIL SALESPEOPLE (HARDWARE STORE, FOR EXAMPLE)
- <3> BOOKS/MAGAZINES
- <4> FROM PACKAGING MATERIALS INCLUDED WITH PRODUCT
- <5> ADVERTIZEMENTS AND CIRCULARS FROM PRODUCT COMPANIES
- <6> LAWN CARE PROVIDING COMPANY
- <7> UNIVERSITY EXTENSION SERVICES

(21) Does your city, township, municipal area, or neighborhood have any laws, covenants, or legislation that restricts lawn management or what can be applied to your lawn laws, covenants, or legislation that restricts your lawn care (like restrictions on chemicals or mowing height)?

- <1> YES, THERE ARE LEGAL REQUIREMENTS
  - <2> NO, THERE ARE NO REQUIREMENTS
- [go to q26a]
- <3> DON'T KNOW

In thinking about the practices you use in taking care of your yard (whatever you do), what are your reasons and motivations for choosing the method you do? Answer the following in terms of their importance

(22) Ease: my lawn care method is low in cost and meets my time constraints

- <1> Very Unimportant
- <2> Somewhat Unimportant
- <3> Neither Important nor Unimportant
- <4> Somewhat Important
- <5> Very Important

(23) Financial: my lawn care improves my property values

- <1> Very Unimportant  
<2> Somewhat Unimportant  
<3> Neither Important nor Unimportant  
<4> Somewhat Important  
<5> Very Important
- (24) Community: my yard care results improve my neighborhood
- <1> Very Unimportant  
<2> Somewhat Unimportant  
<3> Neither Important nor Unimportant  
<4> Somewhat Important  
<5> Very Important
- (25) Safety: my yard care method lowers the risk I face personally from chemicals and machinery
- <1> Very Unimportant  
<2> Somewhat Unimportant  
<3> Neither Important nor Unimportant  
<4> Somewhat Important  
<5> Very Important
- (26) Ecology: my yard care method maintains a healthy ecosystem
- <1> Very Unimportant  
<2> Somewhat Unimportant  
<3> Neither Important nor Unimportant  
<4> Somewhat Important  
<5> Very Important
- (27) What proportion of your entire yard, front and back, is covered by lawn grass?
- <1> all of it  
<2> more than half of it,  
<3> about half of it,  
<4> less than half of it, or  
<5> none of it
- (28) Have you replaced a portion of your lawn with any other form of ground cover?
- <1> YES  
<0> NO
- (28a) If yes, what did you replace the grass with (Shrubs? Flowers? Etc)
- Indicate your agreement or disagreement with the following
- (29) I keep my lawn rather than replacing it with another ground cover because it fits into the look of the neighborhood better than any alternative
- <1> Agree  
<2> Disagree
- (30) I keep my lawn rather than replacing it with another ground cover because it is too expensive to replace
- <1> Agree  
<2> Disagree
- (31) I keep my lawn rather than replacing it with another ground cover because it's easier to care for than alternatives
- <1> Agree  
<2> Disagree
- (32) What is the source of water for your home?
- <1> Municipal (City) water system  
<2> Private well  
<3> Other source
- (33) How would you describe the area where your home is located?
- <1> Urban  
<2> Suburban  
<3> Small Town  
<4> Rural
- Survey Part THREE: Demographic
- Before ending this interview I have a few questions to ask for statistical purposes.
- (34) What is your zip code?  
(35) Age?  
(36) Gender (m/f)?  
(37) Highest degree earned (circle one)
- (1) 1-12 Years (no degree)  
(2) High School or GED  
(3) Associate's Degree  
(4) Bachelors degree  
(5) Masters degree  
(6) Ph.D, M.D., etc.
- (38) If you have an advanced degree (Masters or Ph.D.), what is the field? \_\_\_\_\_  
(39) Annual Household Income
- (1) <\$10,000  
(2) \$10,000-25,000  
(3) \$25,001-40,000  
(4) \$40,001-60,000  
(5) \$60,001-80,000  
(6) >\$80,000

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