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Household behavior and attitudes regarding diversion of organic material from the municipal solid waste stream : a case study of Knox County, Tennessee

Kevin Scott Lamons

To the Graduate Council:

I am submitting herewith a thesis written by Kevin Scott Lamons entitled "Household behavior and attitudes regarding diversion of organic material from the municipal solid waste stream : a case study of Knox County, Tennessee." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

William Park, Major Professor

We have read this thesis and recommend its acceptance:

Roland Roberts, Frank Leuthold, Robert Emmit Jones

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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HOUSEHOLD BEHAVIOR AND ATTITUDES REGARDING DIVERSION OF ORGANIC MATERIAL FROM THE MUNICIPAL SOLID WASTE STREAM: A CASE STUDY OF KNOX COUNTY, TENNESSEE

A THESIS
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MASTER OF SCIENCE
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KEVIN SCOTT LAMONS
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ABSTRACT

Management of municipal solid waste (MSW) has become increasingly important in recent decades. Solid waste officials are often forced to take progressive steps in the areas of waste diversion and source reduction in order to offset the increasing amount of MSW currently being generated.

While much research has focused on recycling programs, composting programs have the potential to increase diversion rates drastically. Composting has long been underutilized as a relatively cost effective strategy for diverting organic wastes. Estimates show that up to 60 percent of the residential waste stream is potentially compostable. Aggressive composting programs can thus divert a substantial fraction of MSW from landfills. Yardwaste alone has been estimated to account for 17.6 percent of the weight of municipal solid waste nationally (Franklin Associates, 1990).

The overall objective of this research project was to analyze the current situation in Knox County, Tennessee with respect to solid waste management in general, and diversion of organic matter in particular. Specific objectives were:

(1) to identify and describe the current behavior and attitudes of households living in single-family residences in Knox County with respect to generation, diversion, and disposal of waste materials, especially organic matter

(2) to measure attitudes toward, familiarity with, and expected behavioral responses to the following policy options for increasing the diversion of organic matter:

(a) educational programs (e.g., to encourage backyard composting)

(b) regulatory actions (e.g., landfill ban of yard wastes)

(c) incentive strategies (e.g., unit-pricing systems of solid waste disposal)

(3) to identify factors associated with residents' backyard composting behavior

The information used in this study was gained through a telephone survey of Knox County residents living in single-family detached dwellings. The total sample size was 865, including 400 City of Knoxville households and 465 households residing outside the city limits.

Valuable information was gained about Knox County residents' solid waste disposal patterns, as well as their attitudes and perceptions toward solid waste issues. A conceptual model was developed in an attempt to identify factors influencing the probability that residents participate in composting behavior. A logit regression procedure was used to estimate the models for composting tree and shrub trimmings, grass, food, leaves, and composting in general.

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INTRODUCTION

The Municipal Solid Waste Problem

Management of municipal solid waste (MSW) has become increasingly important in recent decades. Not only is the population growing, but the per capita amount of waste produced in the United States is growing as well. In 1960 the average per capita amount of waste produced by Americans was 2.7 pounds per day. By 1988 that figure had risen to nearly 4 pounds (Franklin Associates, 1990). This number has been predicted to increase to approximately 4.4 pounds per capita by the year 2000 and 4.8 pounds by 2010 (U.S. Environmental Protection Agency, 1990 and 1995). Of this waste generated the largest percentages of bulk tonnage are composed of paper/paperboard (36%) and yard waste (20%), both of which are potentially compostable. Increasing amounts of waste is not, however, the only factor affecting MSW management decisions. Increasing opposition to the siting of landfills, shortages of landfill capacity in some areas, and stringent landfill regulations are all factors which influence the decisions of MSW managers. The number of landfills in the United States has been steadily decreasing over recent years. In 1995 landfills in the United States numbered 3,197, down nearly 10 percent from 1994 (Steuteville, 1996).

Municipal solid waste managers are being forced to develop integrated solid waste programs (ISWP) composed of several different management strategies. Three broad strategies include disposal, materials diversion, and source reduction (Miranda et al., 1994). Decision makers are being forced to take progressive steps in the areas of diversion and

source reduction in order to offset the increasing amount of MSW currently being generated. In some communities the progressive steps are not necessarily taken with regard to actual amounts of waste in mind. The concern in these cases is with meeting state goals or mandates or keeping down MSW costs.

Many states, including Tennessee, have taken legislative measures to insure that strategies are implemented to divert materials away from landfills. The Tennessee Solid Waste Management Act of 1991 was passed on May 31, 1991. The main goal of the Act was to reduce the per capita amount of waste that reaches Class I landfills or incinerators by at least 25 percent between 1989 and 1995. Plans developed by the regions included materials recovery for recycling and composting, waste reduction education, and economic incentives (TNDEC, 1996). The largest percentage reductions were to be achieved by diversion of materials through recycling and composting programs, or by diversion of construction and demolition materials away from Class I landfills.

Recycling programs can play a major role in the diversion of materials from landfills. Some communities have easily met their reduction goal through intensifying their current programs or by starting new recycling programs, focusing on materials such as aluminum, paper/paperboard, plastics, and glass. It is also important to note the trend towards the remanufacturing of products so that they are more easily repairable and reusable. Source reduction involves reducing the amount of waste that is produced and can be achieved by using products that contain less packaging, using products that are readily biodegradable, or by reusing products rather than throwing them away. Composting has long been underutilized as a relatively cost effective strategy for diverting organic wastes. Estimates

show that up to 60 percent of the residential waste stream is potentially compostable. Aggressive composting programs can thus divert a substantial fraction of MSW from landfills. Yard waste alone has been estimated to account for 17.6 percent of the weight of municipal solid waste nationally (Franklin Associates, 1990). Backyard composting is another diversion method which involves the separation of compostables from the wastestream by residents. These "compostables" may include materials such as food scraps, some paper products, and yardwastes. After separation these materials are added to a compost pile or compost bin according to prescribed "recipes" where they are allowed to naturally decompose until they are ready to use as soil amendments, mulching material, or a form of natural fertilizer. Centralized composting incorporates the same principles of separation, except compostables are collected or delivered to a central facility where they are composted on an aggregate level.

Objectives

The overall objective of this research project was to analyze the current situation in Knox County, Tennessee with respect to solid waste management in general, and diversion of organic matter in particular. Specific objectives were:

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General Procedures

A first step was to ascertain what is already known about Knox County's solid waste management system. This was done with information from previous city and county surveys, annual reports to the Mayor and the Tennessee Department of Environment and Conservation, and interviews with public officials and private waste haulers.

The next step was to conduct a literature review regarding the experiences of other communities with respect to organic material diversion. The literature review also included studies that have attempted to explain environmental and conservation behavior such as recycling and composting.

The primary data for this study was gained through a comprehensive telephone survey of Knox County residents. The survey was structured so that inferences could be made about residents of the City of Knoxville as well as residents who reside outside the city limits. Questions were developed with a view to acquiring information not only on solid waste disposal, recycling, and composting behavior and attitudes, but also variables that could be expected to influence such behaviors and attitudes.

Finally, a conceptual framework for explaining behaviors and attitudes related to solid waste management was developed. This framework provided the basis for specification of the statistical models to be estimated.

CHAPTER II

SOLID WASTE MANAGEMENT IN KNOX COUNTY, TENNESSEE

Description of Knox County

Knox County, Tennessee is centrally located in the eastern part of the state. Nestled between the Cumberland Mountains and the Great Smoky Mountains, Knox County is easily accessed by rivers such as the Holston and the French Broad. Knox County is even more easily accessed by the vast interstate system. Interstates I-40, running from California to North Carolina, interstate I-75, running from the Great Lakes to the Gulf of Mexico, and interstate I-81, running from Canada to Knoxville, all intersect within the county's geographic boundaries. The nearby mountains cause the temperature to average approximately 60 degrees with a distinct difference between all four seasons. The county's easy access, enjoyable climate, and scenic location draw both visitors and new residents to the area (Ferguson, 1996).

Knox County covers 528 square miles of which 97.87 square miles (18.5%) is within the city limits of Knoxville, the county seat (Metropolitan Planning Commission, 1997). The population at the time of the 1990 census was 335,749. Although only 165,121 lived within the City of Knoxville there were 261,024 residents who responded that they lived in urbanized areas. Of the remaining residents 1,233 responded that they were farm rural and 73,492 responded that they were non-farm rural. The average household size was 2.42 (U.S.

Bureau of the Census, 1990). The estimated population for 1996 was 361,407. If this number is accurate, the county's population has grown by approximately 8 percent in the last six years (U.S. Bureau of the Census, 1996).

The 1990 census offered two different measures of income that can be compared to the rest of the nation. The median household income for Knox County in 1989 was $26,010 with per capita income of $14,007. The median household income for the nation as a whole during the same period was $33,952, while the per capita income was $20,090.

The 1990 census also identified the number of households that lived in single-family-detached dwellings, defined as those dwellings that are designed for a single family and are stand-alone units. This would exclude apartments, townhouses that are attached to one another, and condominiums. Within the city limits, 56.3 percent of households reported living in single-family detached dwellings, while 75.6 percent of households outside the city limits fell into this category. Of the 143,582 households in the city and county combined, 93,797 (65.3%) reported living in single-family-detached dwellings (MPC, 1990).

The size and composition of Knoxville and Knox County create a tremendous need for the effective management of municipal solid waste (MSW). While MSW management decisions are usually made by local officials, state and federal mandates oftentimes come into play. One such mandate has greatly affected the way MSW management decisions in Knox and other counties throughout Tennessee.

TN Solid Waste Management Act of 1991

The TN Solid Waste Management Act of 1991 was passed on May 31, 1991, due in part to pending federal regulations regarding landfills. The Act led to the establishment of 63

planning regions composed of one or more counties. These regions were required to submit plans to reduce the per capita amount of MSW that reaches Class I landfills or incinerators by at least 25 percent between 1989 and 1995. Plans developed by the regions included materials recovery for recycling and composting, education on how to reduce waste generation, economic incentives such as pay-as-you-throw systems for funding MSW, as well as other strategies. The state as a whole reported a 20 percent reduction in per capita MSW disposed of in Class I facilities between 1989 and 1995 (0.9782 tons per capita compared to 1.2159 tons per capita). Of the 63 individual planning regions, 29 achieved the goal, 24 reduced the amount of waste disposed of per capita but did not reach the goal, and ten regions actually increased their disposal tonnage (TNDEC, 1996). The largest percentage reductions came about due to diversion of materials through recycling or composting programs, and by diversion of construction and demolition materials away from Class I facilities.

Assistance with the planning, implementation, and reporting of solid waste programs is available to the regions through a number of organizations. These agencies include The Solid Waste Adult Education Task Force, The Tennessee Department of Environment and Conservation, The University of Tennessee Institute for Public Service, The University of Tennessee Waste Management Research and Education Institute, The Department of Transportation, The U.S. Postal Service, Tennessee Valley Authority, The Recycling Market Advisory Council, and many others. Assistance is also available in financing programs designed to help local regions meet the 25 percent goal. This assistance is offered in the form of grants for recycling equipment, recycling rebates, waste tire storage grants, grants for

updating solid waste plans, planning grants for development districts, convenience center grants, household hazardous waste grants, education grants, and waste tire option programs. Grants awarded for the fiscal-year 1995-1996 totaled $8,760,713. This amount was divided between 244 local governments and nonprofit organizations (TDEC, 1997).

Knox County Planning Region

Knox County makes up one of the planning regions that resulted from the 1991 Act. MSW management decisions are made for the county by its Division of Solid Waste and for the city by its Solid Waste Office. While the two offices are independent, they attempt to coordinate their efforts in order to increase the effectiveness of programs.

While the 25 percent goal is achievable by the Knox County planning region, there have been many obstacles recognized. Solid waste officials specifically cite residents' lack of knowledge about the MSW problem, lack of concern, misconceptions about the amount of time and effort involved in diversion and reduction strategies, political factors, lack of regulations, low private disposal costs, transient populations of workers and students, and the lack of large-scale commercial involvement in diversion programs. Another significant problem that has been identified by John Evans, Knox County Solid Waste Director, is the difficulty in siting facilities for recycling and composting programs.

In its Regional Solid Waste Plan Annual Progress Report for the calender year 1996, Knox County highlighted the major accomplishments that were made during the year, as well as the progress towards the reduction goal through current strategies. The major accomplishments for the 1996 calender year included:

- Operation of two new roll-off systems for collection of recyclables at Convenience Centers. (Existing facilities for the collection of recyclables in the county include convenience centers where household wastes are disposed of. The city offers several drop-off sites for recyclables as well as a limited amount of curbside pick-up in some areas.)

- Implementation of multi-faceted commercial waste reduction and recycling programs. Program includes development of guides for hospitality establishments and offices, sponsoring of round table events for targeted commercial sectors, providing technical support and more.

- The City of Knoxville implemented a cardboard/office paper recycling program for businesses located in the downtown area.

- Nine (of eleven) Knoxville recycling drop-off centers now offer mixed paper recycling.

- Maintenance of comprehensive recycling and composting programs at Knox County Detention Facility and Knox County Regional Farmers' Market. Continued operation of City-County Building recycling and composting program and maintenance of additional composting demonstration sites including: Farragut, Halls, and South Doyle High Schools. Begin expansion of County office recycling to all other Knox County Buildings, including Knox Schools Administration offices, to be completed by April 1997.

- Design and set-up of a mobile compost demonstration trailer for educational activities. The Composter on Wheels or "C.O.W." features various composting bins, signage about composting and mulching, literature display and more.

- Implementation of Tennessee's second Master Composter/Recycler Program with 29 volunteers in the Spring 1996. Program graduates have completed over 800 hours of volunteer work.

- Maintenance of full operation of the City of Knoxville's composting program, diverting almost 27,000 tons of grass and brush clippings.

- Sponsoring of another TORO Mulching Mower promotional in the Spring of 1996 in which 50 mulching mowers were given to citizens for three months. This promotion saved an estimated 800 bags of grass from the landfill.

- The City of Knoxville, with a contract with Norseman Plastics, distributed more than 2000 backyard compost bins to area residents in February 1996. These bins were provided at low cost to the residents.

- Comprehensive recycling program for Knox County Schools beginning March 1996, with more than 85 percent of the schools participating in recycling of all paper grades. At least twelve schools are now composting either in the classroom or one (or two) day(s) per week for the entire school.

- Establishment of a grant program to schools. Sixteen schools and/or educational programs have received approximately $500 each for implementation of waste reduction, reuse, recycling and/or composting programs.

- In partnership with the IJAMS Nature Center, twenty-three schools have signed-up for the Earth Flag program, a multi-faceted program fostering recycling, composting and other waste management opportunities.

- Work with various parties (including the Vice-Chancellor) to help improve the University of Tennessee Campus Recycling Program. Hiring of an intern to assist collection, development and distribution of educational publications and the set-up of ongoing opportunities for education and campus involvement.

- Work began on a permanent "Buy Recycled" display at the new IJAMS Nature Center. The display will be a walk-through "house-like" motif featuring samples of products containing recovered materials.

- Construction to renovate the City of Knoxville's Transfer Station, addition of a Recycling Baling Facility and permanent Household Hazardous Waste Facility for use by both City and County residents is expected to be completed in April of 1997.

- Continuation of a waste tire program for collection and transport of passenger tires for use as tire derived fuel (TDF) and shipment of truck tires for same.

- One Class III Landfill (which can accept both wood and yardwastes) and one Class III/IV (which can accept wood and yardwastes as well as construction and demolition wastes) Landfill are open to Knox County residents and businesses.

For the calender year 1995 the Knox County region had actually reported a waste disposal *increase* of nearly five percent over the 1989 base year. While nine other regions also saw increases over their base year numbers, Knox County officials were obviously disappointed with these results. Through the efforts that were already in place and the new strategies implemented in 1996 the county was actually able to reverse this trend of increasing tonnage and report a substantial decrease for calendar 1996. This decrease amounted to 36,674 tons from the base year. While this did not meet the state goal of 25 percent it was a 15.52 percent reduction. (The per capita annual tonnage for 1989 was 1.1600 compared to 0.98 tons per capita in 1996. The goal would be to reach a per capita annual tonnage rate of 0.87.)

Athena Lee Bradley, Recycling Coordinator for Knox County, attributed the success during the 1996 year to many factors. Bradley stated that continuing environmental education efforts by the county and city of Knoxville are beginning to "catch on" with residents. Other agencies involved in such educational efforts include IJAMS Nature Center and the Knoxville

Recycling Coalition. Efforts to educate the public on the diversion potential through backyard composting are believed to be making a contribution. The county is involved with The University of Tennessee Agricultural Extension Service in operating a Master Composter Training Program which educates volunteers in composting methods. These volunteers in turn provide community service hours in order to teach the rest of the population. The City of Knoxville has participated in two sales of backyard composting bins to the public. In the first year alone over two thousand bins were sold. The opening of two new Class III landfills that accept construction and demolition materials, as well as wood and yardwaste, has helped to divert between 4 and 5 percent or approximately one-third of the total amount reduced by Knox County as a whole (Bradley, 1997). These new landfills offer a lower tipping fee and therefore an economic incentive to generators of C&D waste to divert these types of materials from Class I landfills. Fay Portable Buildings, which currently holds the contract to haul away the waste materials from the Knox County's seven solid waste convenience centers is actively separating recyclables materials from the roll-off containers. These are recyclable items that were not source-separated by residents before disposal. There has also been an increase in the number of public and private schools that are participating in recycling and composting efforts. These appear to be the main factors contributing to the substantial progress in 1996 (Knox Solid Waste Planning Region, 1997).

The region's ten-year plan for reaching the state goal and the progress towards each strategy are as follows:

Strategy	Ten-Year Plan %	% Achieved
Diversion to other types of landfills	6.5 %	4.29%
Source Reduction	0.01%	0.01%
Recycling	10.02%	7.52%
Composting	9.9 %	3.71%

These results clearly show that the greatest relative successes have been in the areas of diversion and recycling (Knox Solid Waste Planning Region, 1997).

The City of Knoxville offers residential curbside pick-up of garbage, as well as collection of grass clippings, brush, and other yardwastes. The city also offers drop-off locations around the city for recyclables and a transfer station where residents can take almost all types of waste materials. In its 1996 Annual Report to the Mayor the City of Knoxville Solid Waste Office reported that it was able to achieve a 31.04 percent diversion rate. This figure was calculated based on a total waste stream of 122,617.20 tons. The total amount that was recycled and composted was 30,896.86 tons, while the exact tonnage of each is not available, city officials estimate that the majority of this figure was accomplished through composting of yard waste. The remaining 7,162 tons was diverted through other methods.

Previous City of Knoxville Resident Surveys

Two telephone surveys were conducted in recent years for the City of Knoxville by the Social Science Research Institute at the University of Tennessee, Knoxville. The first

was conducted in September 1992 and the second in March 1995. Both surveys sampled 600 households and solicited citizen opinions regarding the solid waste services provided by the city.

The 1992 survey contained information regarding participation in curbside recycling and use of drop-off sites. Citizens stated that they would like to see expansion of the curbside recycling programs that were available at that time, but would still be willing to take recyclables to the drop-off sites if the recycling collection was discontinued. The majority of residents surveyed were willing to pay a monthly fee for the expansion of curbside pick-up to all city residents. One question asked if residents would support a variable fee-based system for general solid waste services. Sixty percent of the residents opposed this type of system, 32.5 percent were in favor, and 7.4 percent were not sure (SSRI, 1992).

The 1995 survey found that a majority of citizens feel that recycling and composting are important activities and are pleased with the services provided by the city. In fact, there was significant support for the expansion of current programs. Residents were especially in favor of increased availability of curbside pick-up of recyclables. Residents were concerned however with how these increased services would be funded. There was overwhelming opposition to property taxes. Many residents stated that they would be willing to pay a user fee for participating in such programs. Sixty percent of residents reported using the city's drop off sites for recyclables at least some of the time. Favorable ratings on overall service were given by 97 percent of the residents sampled (SSRI, 1996).

No similar survey has been conducted of county residents as a whole. Therefore little is known about how county residents feel about solid waste issues.

CHAPTER III

LITERATURE REVIEW

There have been many studies conducted in recent years with regard to solid waste management, especially disposal, recycling, and diversion. While this literature review is not exhaustive, an attempt was made to select the most relevant studies relating to diversion of organic material through composting.

Benefits of Composting

Composting programs bring about benefits in several ways. The most easily recognizable benefit of composting is the increased diversion rates of organic materials from the residential waste stream requiring disposal. This type of diversion can be made either through home composting programs or through centralized composting programs. Garland et al. (1995) found that over 3,000 community and commercial yard trimmings facilities exist in the United States. This rising number has been influenced by the fact that at least 27 states have instituted a ban on disposal of yard trimmings in landfills. The authors also estimated that yard trimmings and food wastes comprise at least 23 percent of the municipal waste stream. The other benefits of compost listed by Garland et al. include:

Soil enrichment
-adds organic bulk, humus, and cation exchange to regenerate poor soils
-increases soil organic content and water retention in both clay and sandy soils
-restores soil structure after reduction of natural soil microbes by chemical fertilizer
-reduces fertilizer requirements by at least 50% which means cost savings from reduced use of water, fertilizer, and pesticides
-compost composition can be tailored to address specific soil, water, and air problems

Pollution remediation
-absorbs odors and degrades volatile organic compounds (VOC)
-binds heavy metals which are then no longer bioavailable to man or animals and cannot migrate to water resources or be taken up by plants
-degrades or completely eliminates wood preservatives, petroleum products, pesticides, and both chlorinated and non-chlorinated hydrocarbons in contaminated soils
Pollution prevention
-avoids methane production and leachate formation in landfills by diverting organics from landfills into compost (methane is a major contributor to global warming)
-prevention of pollutants in storm water runoff from reaching water resources
-prevents erosion of and silting on embankments parallel to creeks, lakes, and rivers
-prevents erosion and turf loss on roadsides, hillsides, playing fields, and golf courses

Home Composting Programs

There have been several studies conducted in recent years which looked at the effectiveness of community programs aimed at increasing home or backyard composting. These studies attempted to estimate participation rates, diversion rates (both actual and potential), and key program elements.

In 1995 the Composting Council and Environmental Protection Agency conducted a survey of municipalities in order to quantitatively identify the costs and benefits of home composting programs. The purpose of the study was to analyze the cost effectiveness of home composting programs in areas of varying incomes, size, and metropolitanism. The study suggested minimum program elements required for success. These elements included a paid staff person, distribution of educational literature, workshops for educational purposes, the distribution of home composting bins, and education of children and teachers in local school systems about composting. Additional elements may include advertising within the local media, training of Master Composter volunteers, demonstration sites, and telephone

hotlines for questions residents might encounter. Also offered were a list of benefits of composting programs and tips to help in the development of new programs (Sherman, 1996).

The following table lists the net economic benefits found by the survey.

Net benefits summary

municipal costs per ton composted	
local govt expenditures of home composting (avg)	$12 per ton
total municipal costs	$12 per ton
municipal benefits per ton composted	
avoided collection costs (avg)	$23 per ton
avoided disposal costs (avg)	$32 per ton
volunteer labor	<$1 per ton
soil amendment creation	$benefits accrue to individual participant
avoided air pollution and resource depletion	not measured in dollar amounts
total municipal benefits	$55-$56 per ton
total net benefit (benefits minus costs)	$43-$44 per ton

Another study by Applied Compost Consulting (Berkeley, California) used 1995 data collected by the Composting Council and the EPA. This study used case study analysis in order to show the diversity of community types that have been successful in promoting home composting programs. Eight cases were chosen, and the quantitative findings for all are summarized in the following table. More details on two specific cases are then presented (Sherman, 1996).

Summary of results

City	Pop.	Annual Income	Part. rate	lbs./hh	tons/yr	cost/hh($)
Alameda County, CA	1,300k	23k	6%	600	4,000	0.40
Amherst, MA	18k	23k	18%	500	250	0.83
Ann Arbor, MI	110k	40k	50%	2,000	13,000	0.22
Austin, TX	500k	30k	3%	200	379	0.06
E. Chicago, IN	33k	19k	20%	1,900	1,400	0.73
Glendale, CA	190k	35k	10%	860	1,000	0.22
Olympia, WA	37k	28k	60%	500	1,500	0.31
Palm Beach County, FL	930k	32k	2%	440	1,391	0.15

Ken Wells, director of the Sonoma County, California Waste Management Agency, believes that the best way to reach a municipal solid waste diversion goal is through home composting. In 1993 his county was faced with a 50 percent waste reduction mandate and turned to the University of California Cooperative Extension Agency and Waste Management Agency. The county began a Master Gardener program to educate volunteers on how to teach composting methods. Through demonstration sites and over 60 workshops per year thousands of residents are educated annually. In 1995-96 there were 1,878 participants, most of whom learned of the workshops through the local newspapers. When a follow-up survey was administered later that year, 68 percent said that they had begun or increased their composting activities since the workshop (Vossen and Rilla, 1997).

When Montgomery County, Maryland was faced with a state yardwaste ban at the landfill it started a major program to encourage backyard composting and grasscycling. Over two years the county spent $600,000 on street banners, posters, television ads, radio ads, workshops, a video, newspaper ads, train stations ads, information booths at local shopping centers and malls and direct mailings. After 1995, a survey was sent out to a sample of county residents in order to determine the effectiveness of the program. Sixty-six percent of the respondents reported that they were grasscycling and 60 percent reported composting. This compares to 40 percent grasscycling and an even lower rate of composting before the program started. Residents were also asked how they learned about the county's program. Seventy-nine percent said direct mailing, 26 percent said word of mouth, 22 percent said posters, 20 percent said newspaper ads, 9 percent said workshops and events, 6 percent said television ads, and 4 percent said radio spots (Riggle, 1996). These results are encouraging

to other municipalities facing such circumstances. Montgomery County would have had to spend over two million dollars to upgrade existing disposal facilities necessary to handle the amount of grass and yard trimmings that were previously generated (Riggle, 1996).

Centralized Composting Programs

Along with home composting programs, centralized composting programs can be successful in diverting grass clippings and other yard wastes from landfills. Numerous studies have been done to determine the costs of collection and drop-off centers for yard wastes, and effectiveness of these types of programs.

A national survey was conducted of 60 randomly selected cities in the United States whose population exceeded 25,000. The goal of the survey was to determine how many of the cities offered curbside yardwaste pick-up, potential diversion rates, and the estimated cost to pick up recyclables and compostables. The most important results were that (1) per ton, yard debris is more expensive to collect than regular trash, but less expensive than recyclables (2) per household, the cost to provide collection of both yard debris and recyclables is not significantly greater than the cost to collect recyclables only and (3) diversion rates are highest when a community offers collection of regular trash, recyclables, and yard debris (Stevens, 1994).

In order for central composting ventures to be successful, whether public or private, there must be widespread community support (Cobb and Rosenfield, 1991 and Richard et al., 1990). Cobb and Rosenfield found that the general public often feels a lack of faith in local officials and high technology processes. Residents often feel misled, misinformed, or even ignored in solid waste decision making. The authors suggest that since solid waste disposal

is such a costly activity and affects all residents, there should be some sort of plan made by solid waste officials that would involve and educate residents about solid waste decisions.

Economic Incentives to Divert and Reduce

Economists would argue that financial incentives represent a potentially powerful tool for encouraging recycling and composting by households. In fact, many municipalities have turned to pay-as-you-throw (PAYT) systems of waste disposal to do just that. These systems charge for solid waste disposal services based on the total amount of waste that a household generates. In Aberdeen, Maryland residents were polled to see if they would support such a system. Educational literature was also included with the survey. Seventy percent of the respondents reported that they would support such a system. The residents felt that they were helping to make the decision and therefore were more supportive than if they were forced into a pay-as-you-throw system (Canterbury, 1996). Canterbury went on to say that the local officials must convince residents that MSW management costs are real. MSW collection and disposal may appear to be free but are actually covered out of general tax revenues. The new system must be shown to potentially reduce actual per resident cost and not be seen as an additional "tax".

Another study that looked at pay-as-you-throw (also called unit-pricing) systems was done by Miranda et al. in 1991. The authors note that recycling and composting behavior is higher in cities that have adopted a PAYT system than in those that have not. Unit-pricing tends to encourage not only diversion, but source reduction. The authors suggest that when implementing PAYT systems, municipalities should charge according to marginal costs. Traditional costing techniques charge based on average costs and lead to inefficient levels of

waste generation. The authors collected data from 21 cities between July 1990 and January 1992 regarding their implementation of unit-pricing systems. These cities were not at all considered representative of the United States and therefore conclusions cannot be used to predict results for other cities. All 21 cities experienced a decrease in tonnage of waste landfilled after implementation, ranging from 17 percent to 74 percent.

Behavioral Research

Researchers in the discipline of sociology tend to focus on other factors that may influence the behavior of residents with respect to resource conservation or environmental protection. While most of these sociological studies that have been done are concerned with recycling behavior, they would appear to have relevance for composting and other diversion or waste reduction behavior.

Resource conservation behavior has been shown to be influenced by broadly defined factors such as household background, attitudes and beliefs, external incentives and constraints, values and world views, knowledge, attention and behavioral commitment, and resource-using or resource-saving behavior (Stern and Oskamp, 1987). Stern and Oskamp defined household background as including such variables as income, education, and other factors usually categorized as demographic information. Attitudes and beliefs included such things as concern about national energy situation, beliefs that neighbors expect you not to waste, etc. External incentives and constraints included such variables and constraints as home size, whether or not the individual owned or rented the home, technology available, etc. The other categories of variables were defined in detail as well.

In her M.S. thesis Caroline Bell (May 1993) used a logit model to explain behavior of farmers with respect to participation in a federal tree planting program. Her study also estimated a relationship between personal and farm characteristics and the probability that an individual will participate in the program. Bell categorized the specific attributes or characteristics into the following broad categories: (1) personal characteristics such as income, education, occupation, etc. (2) features of the farm such as acres owned, size of the farm, etc. (3) attitudes and beliefs about conservation practices (4) cost to the individual of participating in the program (5) income of the individual.

In his article entitled "Understanding Paper Recycling in an Institutionally Supportive Setting: An Application of the Theory of Reasoned Action", Robert Jones suggested that traditional research attempted to use extrinsic rewards, such as money, prizes, etc., to change behavior. This practice has proven over time to change behavior for a short time only (Luyben and Bailey, 1979, Witmer and Geller, 1976, McClelland and Canter, 1981). When the rewards are revoked the behavior reverts back to normal. Jones also suggested that participation in desired behavior, such as recycling, rises when the behavior is institutionally supported (Hines, 1984). In the recycling example, institutional support might include readily accessible and convenient containers for recyclables, educational information, written and verbal appeals for participation by authorities, as well as incentives. Jones has applied the Ajzen-Fishbein theory of reasoned action to explain behavioral change. This theory implies that people consider the implications of their actions before deciding to engage or not to engage in a given behavior. There are two predictors of behavioral intentions: "behavioral beliefs" and "normative beliefs." Behavioral beliefs refer to people's attitude towards the act

and outcomes, while normative beliefs refer to the perception of significant others' attitude towards the act and outcomes. Jones tested the application of this theory by conducting a survey of paper recycling among faculty members at a university. Jones was able to show that faculty members allow their own beliefs about recycling and its outcomes and the beliefs of others to influence their decision to participate or not to participate in recycling behavior. This implies that by having knowledge of existing beliefs regarding proposed behavioral changes, decision makers can be more effective in strategy development.

Another way to encourage behavioral change that has proven successful in the area of recycling is the practice of goal setting. Two studies (Hamad et al., 1980-1981 and McCaul and Kopp, 1982) have shown that when subjects have goals set for them they are more likely to practice the desired behavior, in this case recycling. The authors suggest that if subjects are allowed to set their own goals they will be even more likely to succeed.

In the one of his many studies De Young found that recycling behavior is related to three factors affecting personal satisfaction (1) avoiding wasteful practices (2) being self-sufficient and (3) participating in a program where one's actions "make a difference" (1986). In another study he found that residents report that they participate in order to help conserve natural resources (1989). These studies seem to show that higher participation levels can be achieved in response to intrinsic satisfaction variables than in response to monetary incentives. While monetary incentives might encourage an initial increase in recycling behavior, the recycling level may return to some baseline level if the rewards or incentives are removed.

In their 1991 study Oskamp et al. used a simple set of categories to investigate what factors influence household recycling behavior. In this study the researchers used four broad

categories: (1) demographic variables such as age, education, home ownership, children present in household, etc. (2) knowledge variables such as general knowledge about conservation and recycling (3) attitudinal variables such as whether or not the individual considered themselves to be pro-recycling, whether or not the individual thought the solid waste problem was serious or not, political orientation, etc. (4) behavioral variables such as information on past recycling behavior, whether or not the individual had friends that recycle, etc.. It was found that just because people are environmentally concerned they are not always going to participate in behaviors such as curbside recycling. This stems from the fact that environmental attitudes are comprised of different components. For instance recycling can be seen as one specific component of "environmental behavior". Curbside recycling participation was found , however, to be influenced by specific attitudes about recycling. This implies that the subjects of an encouragement strategy must be educated on other benefits of recycling and not just that it is "good for the environment". The study also showed that residents of single-family-detached housing units were more likely to participate in curbside recycling than residents of multi-family dwellings such as apartments and condominiums. The assumptions that owners of homes were more likely to recycle than renters, and that social influence of friends and neighbors are also important factors in recycling participation (Oskamp et al. 1991). Few other demographic variables or attitude variables were found to have a strong influence on recycling behavior.

Schultz and Oskamp (1996) looked at three different studies regarding the relationship between attitudes and behaviors. In these studies the authors hypothesized that, "When the amount of effort required to perform a behavior is high, a strong attitude is needed if the

behavior is to occur. When the amount of effort required for a behavior is low, a weak attitude may be sufficient for action." Their findings supported this theory and suggest that in order to use attitudes as a predictor of behavior, one must also consider the amount of effort required.

Another study which was aimed at looking at the differences between recyclers and non-recyclers was conducted by Vining and Ebreo (1990). The researchers found that on average recyclers were more accurately informed with regard to recycling information than non-recyclers. The researchers reported that the convenience and monetary incentives were an important reason why many individuals participated in recycling activity. The attitudes and beliefs that both recyclers and non-recyclers held about the environment in general did not seem to differ significantly. Both groups also reported that social influence did not influence their decision of whether or not to recycle. Vining and Ebreo hypothesize that this is because recycling generally occurs behind closed doors and is not readily visible to one's peers.

Other factors which have been suggested as influences on recycling behavior include concern about the environment and related issues (McGuiness et al., 1977), goal setting and seeing one's friends recycle (McCaul and Kopp, 1982), making a public commitment to recycle (Burns and Oskamp, 1986 and Katzev and Pardini, 1988).

One of the most recent studies to explain household recycling behavior is by Jakus, Tiller, and Park (1997). In their research the authors studied a recycling drop off system in a rural county in Tennessee. Findings of this study indicated that factors which are most influential on a household's decision to recycle are those associated with household production technology. Several demographic factors were also revealed to be influential.

Those individuals with higher incomes were more likely to recycle than those of lower incomes, older individuals were more likely to recycle than younger individuals, and those who had friends and family that recycled were more likely to recycle than those who did not have that peer influence. These results are similar to those found in previous research, however the research differs in some respects. Income was found to be "quadratic" rather than linear. It has also been previously suggested that home ownership was directly related to recycling behavior. This study suggests that home ownership is not the real indicator, but production constraints of the household are. The factor of home ownership may serve as a proxy of these constraints. Household production technology was measured by variables which measured factors such as: whether the household thought that they had adequate storage space available for recyclables, whether or not the household believed that they generated enough materials to warrant recycling, and the household's perception of the amount of time that recycling required.

Chapter VI will develop a conceptual framework and statistical model for explaining composting behavior. This framework and the subsequent explanatory models will draw heavily on the articles presented in this literature review. Basic economic theory will also be applied in order to determine factors which are expected to influence composting behavior.

CHAPTER IV

SURVEY DEVELOPMENT

Survey Type

A personal survey was used to identify current behavioral practices as well as attitudes and beliefs of residents of Knox County, Tennessee regarding solid waste issues. A telephone methodology was chosen for several reasons, including quick turn-around time for results (quicker than personal interviews and mail surveys), greater interviewer control, and the ability to address problems immediately.

The cost of telephone surveys is greater than mail surveys, but lower than personal interviews. These costs reflect the labor intensity of the interviews. In this study there were no long distance phone costs because the calls originated in Knoxville and were only placed to Knox County residents. This was another selling point of a telephone survey.

Problems do exist, however, with telephone surveys. Residents are oftentimes interrupted from their daily lives by telephone interviewers or solicitors. These interruptions tend to give telephones interviews a bad reputation, thus causing a relatively high refusal rate for this type of survey. A successful survey must be structured so that the respondent knows right away what the survey is about and why it is important to participate. If the respondent sees what positive effect the information gained through the survey may directly or indirectly have on his life, then he is more likely to participate in the process.

Another problem with telephone surveys is that only 93 percent of American households have telephones in the home. The 7 percent of the population that is estimated

to not have phones must be evaluated in order to see if they are a subset of the population that is important to the survey. These households tend to be those below the poverty level (Dilman and Salant, 1994). Another subset that is often excluded with conventional telephone surveys is those that have unpublished numbers or have recently moved. Dilman and Salant estimated that approximately one in five households in the United States move every year. Recent moves increase the problem of incomplete phone listings. The problem of incomplete listings can be solved by using a technique such as random-digit-dialing, as was used here. This process uses computer software to generate and dial random numbers. This ensures that each number in the calling area has an equal probability of being dialed. In this study the software was pre-loaded with valid Knox County prefixes so that the numbers that were generated were more likely to be valid.

One characteristic of telephone surveys that is both an advantage and a disadvantage is the fact that the interviewer can have an influence on the responses. This can be good if the interviewer is prompting the respondent for an appropriate response, but is bad if the interviewer brings in a bias based on how the question is asked or based on voice inflection.

Initial Survey Design

The initial survey design was developed from a short list of questions directed at the information critical to completion of the study's objectives. Over time the questionnaire grew to several pages and began to take on a more structured format. The questionnaire was reviewed by a number of researchers with interest and expertise in the subject matter. Input was solicited from key officials with the City of Knoxville and Knox County throughout the survey development process.

Once a preliminary questionnaire was completed a professional survey center was employed. The Social Science Research Institute (SSRI) at the University of Tennessee was brought in to further advise on the design of the survey instrument so as to eliminate potential bias and to insure that the respondent would answer the question with an appropriate response. SSRI formatted the survey for their Computer Assisted Telephone Interviewing (CATI) system. Approximately 20 pilot interviews were then conducted to see what problems or questions may arise. After a few changes SSRI was ready to begin the full interviewing process. Appendix A is a copy of the final survey instrument.

Survey Implementation

The interviews were conducted at SSRI's facility in downtown Knoxville by part-time callers. These callers were trained on how to properly conduct interviews and how to use the CATI system. This training included instructions to follow the script verbatim and not attempt to elicit desired responses. Questions about this particular survey instrument were answered so that the interviewer understood the question and how to elicit an appropriate and usable response. The system used by SSRI allowed up to 15 interviewers at a time to make calls and enter responses into the computer database as they were given. Based on the previous response the computer was programmed to bring the next question on to the screen and guide the interviewer through the entire survey. This insured that questions were asked in the appropriate order and that only questions that were relevant to that particular resident were asked.

A sample size of eight hundred was chosen. Four hundred responses each from residents inside and outside the City of Knoxville was enough to claim a five percent margin

of error for statistical estimates of each group separately. By obtaining a sufficient number of responses from both city and non-city residents, comparisons could also be made between the two groups.

The survey center callers began calling the week of September 8, 1997 and continued for approximately two weeks. Calls were placed Sunday through Thursday between the hours of 6:00 p.m. and 9:00 p.m. The center waited until the week after Labor Day so that residents would have time to settle in from the Labor Day holiday and the back to school rush. This was done with the hope of obtaining a higher completion rate.

Appendix C summarizes the outcomes of the calls that were made by enumerators. The refusal rate for this survey was relatively high. It is important to note that the exclusion of individuals who were unavailable to complete the survey may introduce some bias. For instance, those who work long hours may be less likely to compost due to time constraints.

CHAPTER V

GENERAL FINDINGS FROM SURVEY

Introduction

As stated previously, the general objective of this study was to analyze the current situation in Knox County, Tennessee with respect to solid waste management. The first specific objective was to describe the current behavior and attitudes of households living in single-family dwellings with respect to generation, diversion, and disposal of solid waste materials, especially organic material such as yard wastes. The second specific objective was to measure attitudes toward, familiarity with, and expected behavioral responses to the following policy options for increasing the diversion of organic matter: educational programs, regulatory actions, and economic incentive strategies. While the complete survey results are reported in Appendix B, there are a number of findings deserving of special attention. These are summarized following a brief description of the sample.

Description of Sample

The survey data included information collected in 865 telephone interviews. The sample was planned to include only 800 interviews, however the interviews that were used to pilot test the survey instrument were also included in the sample. This inclusion was possible since the only changes that were made to the survey after pilot testing were in the wording of one or two questions. The interviewers were to complete one-half of the surveys with residents inside the city and one-half with non-city residents. The one-half quota was reached for the city first, therefore, potential interviewees were screened so that only county

residents were interviewed after that. There were slightly over four hundred interviews completed for the county due to the fact that several interviews were being conducted simultaneously as the quota was met. The distribution of the sample, as compared to data for Knox County as a whole, with respect to basic socioeconomic variables appears on page 34.

Comparison of the survey sample distributions with those for Knox County as a whole (from the 1990 census data) indicates significant differences. This can be attributed to the fact that the sample was restricted to households living in single family detached dwellings. Thus, income, education, and age would naturally be higher for those in the sample than for the county residents as a whole. The percent of home ownership was also higher in the sample, as expected. Census data was not easily available for single family detached dwellings only. As a result it is difficult to say how representative the sample is of all households living in single family detached dwellings in the county.

Solid Waste Disposal

One question of importance was, "How does your household dispose of its garbage?" The responses given by respondents in the sample are summarized in Table 5.1. This shows that 43.6% of respondents reported that they had city pick-up of garbage. This number was expected to be slightly higher since 400 out of 865 (46.2%) reported that their home was within city limits. The reason for the difference may be that the City of Knoxville contracts with Browning Ferris Industries (BFI) for their city pick-up. Some respondents may have mistakenly thought that they subscribed to BFI on an individual household basis. This error may have occurred in cases where the individual that was interviewed was not the primary decision maker for the household and, therefore, did not know who provided garbage

Category		Survey Sample	Knox County (1990 Census)
Households in	City	46% (400)	53% (76,453)
	County	54% (465)	47% (67,129)
	Total	100% (865)	100% (143,582)
Single family dwellings		100%	64%
Mean household size		2.70	2.42
Households with school-aged children		32%	35%
Home ownership	Yes	89%	64%
	No	11%	36%
	Total	100%	100%
Education	Not H.S. grad.	7%	24%
	High school grad	20%	27%
	Some college	31%	28%
	College Grads.	26%	14%
	Grad. or Prof.	16%	7%
	Total	100%	100%
Income	Mean hh income	n/a	$26,010
	<$12,500	10%	24%
	$12,500-$25,000	14%	23%
	$25,000-$35,000	18%	16%
	$35,000-$50,000	20%	16%
	$50,000+	38%	21%
	Total	100%	100%
Mean age	(years)	49.57	n/a
Age by Category	18-25	6%	16%
	26-35	15%	23%
	36-45	24%	20%
	46-55	22%	13%
	56-65	13%	12%
	65+	20%	6%
	Total	100%	100%

Table 5.1
Household Behavior With Respect to Garbage

How Household Garbage is Disposed of	% of Sample Reporting This Behavior
City Pick-up	43.6
County Resident Subscribing to Private Hauler	25.5
County Resident Using Convenience Centers	26.6
Burning	0.8
Burying	0.3
Other	3.1
Total	100.0

services. Twenty-five and one-half percent of households reported that they contracted with private haulers such as BFI or Waste Management for their garbage services. Another 26.6% of the sample reported that they dropped off their garbage at the convenience centers operated by Knox County. This percentage indicates that, of the county residents sampled, approximately one-half reported using the convenience centers as their primary garbage disposal method. This percentage is much higher than the one-quarter that county officials had anticipated. The remaining households buried, burned, or disposed of their garbage in other ways.

Recycling Behavior

Households were also asked what they did with their recyclable materials. Responses to this question are summarized in Table 5.2. It is important to note that only 18.2% of the sample reported that they did not recycle anything. This implies that just over 80% of Knox County residents recycle at least one type of item. Most of these households (48.3% of the

Table 5.2
Household Behavior With Respect to Recyclables

How Recyclables are Disposed of	**% of Sample Reporting This Behavior**
Private Hauler Picks Up at Curb	15.8
Drop-off at Convenience Center (County)	25.8
Drop-off at City Site	22.5
Take to Processor of Recyclables	11.3
Don't Recycle	18.2
Other	5.8
Not Sure	0.6
Total	100.0

total sample) take advantage of either the county convenience center drop-off sites or the city drop-off sites located at area shopping centers.

The different types of recyclable materials and the percentage of households which do or do not recycle each is summarized in Table 5.3. The materials that have the highest percentage of households recycling are aluminum cans, newspapers, plastic, glass, steel and tin cans, cardboard, and other paper products, respectively. The last row of the table reports that 46.4% of the sample households recycle four or more types of materials. These relatively high recycling rates by the sample are reflective of the fact that 81.4% of respondents disagreed that recycling required too much space to be worthwhile, and 88.5% disagreed that recycling required too much effort to be worthwhile. The distribution of sample households by number of materials recycled is summarized by Table 5.4. It is shown in this table that 20.3% of the sample do not recycle any materials. This percentage is inconsistent with 18.2% of households which do not recycle any materials that was reported in Table 5.2. This difference is due to inconsistency of respondents answers. Neither question used in the

Table 5.3
Frequency of Materials Recycled

Materials Recycled	**% YES**	**% NO**	**Total**
Aluminum Cans	67.6	32.4	100.0
Newspapers	63.0	37.0	100.0
Plastic	52.1	47.9	100.0
Glass	42.2	57.8	100.0
Steel and Tin Cans	36.2	63.8	100.0
Cardboard	31.2	68.8	100.0
Paper Products	24.2	75.8	100.0
Other Items	11.2	88.8	100.0
"Serious Recycler", more than four types of materials recycled	46.4	53.6	100.0

Table 5.4
Frequency of Multiple Materials Recycled

Number of Materials Recycled	**Percent Population**	**Cumulative Percent Population**
0	20.3	20.3
1	12.3	32.5
2	11.0	43.5
3	10.1	53.6
4	8.6	62.2
5	14.5	76.6
6	10.6	87.3
7	9.0	96.3
8	3.7	100.0

calculations of these percentages had missing observations, therefore percentages were figured for each using a sample of 865.

Composting Behavior and Organics Disposal

Residents' behavior with respect to yard wastes and food wastes are summarized in Tables 5.5 and 5.6, respectively. The highest reported composting behavior is with regard to grass clippings and leaves. These materials are the easiest to collect and compost of the four materials, therefore it is expected that they would have the highest percentage of respondents participating. Of all responses regarding disposal of grass, leaves, and shrub, only two lead to eventual landfilling of the materials. These are private subscription pick-up and drop-off of materials at convenience centers. Only one option would lead to landfilling of food wastes. This response is "included with household garbage." The percentage of households whose grass clippings, as reported by the sample, reaches landfills is only 3.6%. For leaves the percentage climbs to 7.5% of households, shrub and tree trimmings 11.0% of households, and for food wastes the percentage increases sharply to 37.8% of households. The remainder of these waste materials are diverted either through city pick-up (the city actively composts materials it picks up), active backyard composting, "passive composting" measures such as piling these materials up somewhere to decompose or grasscycling, or by burning or other measures.

The percentages of households which do or do not actively compost each material are reported in Table 5.7. The material that is composted by the most households is leaves. After leaves the next highest percentage of households composts grass clippings, followed by shrub and tree trimmings, and food wastes, respectively. The last row of the table reports that

Table 5.5
Household Behavior With Respect to Yard Wastes

How Disposed of	**Grass (% households)**	**Leaves (% households)**	**Shrub and Tree Trimmings (% households)**
Left on lawn to mow over next time	51.5	28.3	Not applicable
City Pick-up	7.2	14.0	30.5
Private Subscription Pick-up	2.7	5.1	7.5
Drop-off at Convenience Center with Household Garbage	0.9	2.4	3.5
Active Backyard Composting	19.2	20.2	10.8
Piled Up at Back of Lot	6.4	9.8	15.8
Burned	0.9	2.7	9.9
Do Not Generate	4.7	11.1	13.8
Other	4.3	4.5	6.0
Not Sure	2.2	1.9	2.2
Total %	100.0	100.0	100.0

Table 5.6
Household Behavior With Respect To Food Wastes

How Disposed of	**% Households**
Active Backyard Composting	9.5
Included with Household Garbage	37.8
Feed To Livestock or Pets	26.6
Put Down Garbage Disposal	24.0
Other	1.8
Not Sure	0.2
Total	100.0

27.9% of households sampled compost at least one type of materials. This relatively high percentage (considering that almost one-half of the sample had city pick-up of yard wastes available to them) can be attributed to the fact that 78.4% disagreed that composting required too much effort to be worthwhile and 83.1% disagreed that composting required too much yard space to be worthwhile. The percentage of households who reported composting multiple items is summarized in Table 5.8.

Non-city residents in the sample were asked if they would be willing to take compostable materials such as grass, leaves, and other yard wastes to a central facility that is currently under development in Knox County. Materials would be actively composted at this facility and the end product would then be made available to residents for use on their gardens and landscaping or for other uses. While 53.1% said that they would be willing to take materials to this facility for composting, only 39.8% (of that 53.1%) would be willing to pay even a small fee for this service.

Table 5.7
Frequency of Materials Composted

Materials Actively Backyard Composted	**% Yes**	**% No**	**Total**
Grass	20.2	79.8	100.0
Leaves	22.7	77.3	100.0
Shrub and Tree Trimmings	10.8	89.2	100.0
Food Wastes	9.5	90.5	100.0
Composts at least one item (COMPTOT variable)	27.9	72.1	100.0

Table 5.8
Frequency of Multiple Materials Composted

Number of Materials Composted	**Percent Population**	**Cumulative Percent Population**
0	72.1	72.1
1	10.5	82.6
2	7.9	90.5
3	7.3	97.8
4	2.2	100.0

Familiarity with Educational Programs

One of the specific objectives of this study was to determine the percentage of Knox County residents who were aware of educational programs that are currently used by solid waste officials to encourage backyard composting and other diversion methods. The programs that are currently used in Knox County are listed in Table 5.9 along with the percentage of respondents who said they were at least somewhat familiar with the program. The educational programs that are utilized in the county schools range from general knowledge about composting techniques that are taught in science class to special classes or workshops on composting techniques. Several schools involve students in active participation in school-wide composting initiatives. Survey participants were asked if they were aware that composting techniques were taught or at least introduced in local schools. The Master Composter and Recycler Program is currently operating in Knox County and trains volunteers on the "how-to's" of composting. These volunteers in turn must complete service hour requirements training civic groups, homeowner organizations, or others about composting. The Mobile "Composter On Wheels (C.O.W.)" Display Unit is a tractor trailer unit which has been converted to a mobile classroom. This unit is set up in different areas of the county and helps to educate residents. The sale of backyard composting bins is a program that was initiated by the City of Knoxville. The city contracts with an outside vendor to provide low-cost composting units to residents in a one day sale. This program has sold over 2,000 bins in each of its two years of existence, characterizing it as a huge success. In its first year the bins sold out early in the day and rain checks were given out.

As a check on the reliability of the above responses, participants were asked if they were familiar with two fictitious programs. The results from those questions are summarized in Table 5.10. While these programs are employed in other communities, they have never been used in Knox County. Since 12.8% of the sample reported being at least somewhat familiar with one of these programs and 6.3% with another, it can be deduced that the percentages of respondents which reported being familiar with the real programs may be somewhat overstated.

Table 5.9
Familiarity With Real Knox County Programs

Program Name	**% that said they were familiar with the program**	**% not familiar with the program**	**Total**
Education Programs in Local Schools	20.9	79.1	100.0
Master Composter and Recycler Program	9.4	90.6	100.0
Mobile Composter On Wheels Display Unit "C.O.W."	12.2	87.8	100.0
Sale of Backyard Composting Bins at low cost	26.6	73.4	100.0

Table 5.10
Familiarity with Programs Not Used in Knox County

Program Name	**% that said they were familiar with the program**	**% not familiar with the program**	**Total**
Don't Bag-It Campaign	12.8	87.2	100.0
Drop and Swap of Yard Wastes	6.3	93.8	100.0

Attitudes Toward Regulatory Actions

Residents' attitudes towards regulatory actions, specifically a ban of yard wastes from the landfills, are of particular interest to Knox County officials. Interviewers asked respondents if they would support or oppose such legislation. Of the total sample 49.4% supported a ban, while 50.6% opposed. These responses were analyzed with respect to socioeconomic characteristics of participants, with the results summarized Table 5.11. In the age groups up to age 55, a majority of the respondents supported the ban, while a majority in the two categories above age 55 were in opposition. Slightly over one-half of college graduates (56.5%) supported the ban while slightly under one-half of those who were not college graduates (44.7%) supported the ban. In the case of income a consistent trend appeared. As income levels rise the percentage of those who supported the ban also rose also. Chi-square tests were performed for each of the variables. While responses were not significantly different with respect to residence, they were significantly different with respect to age, education, and income.

Responses regarding legislation to ban yard wastes from landfills were also analyzed based on attitudes and behavioral characteristics of the household. Results are summarized in Table 5.12. One might note that respondents who thought that garbage and other items decomposed quickly and naturally in landfills, were less likely to support a ban. Respondents who did not think that garbage and other items broke down quickly and naturally in landfills were more likely to support the ban. This is logical due to the fact that if items did readily break down in landfills then some might consider a ban unnecessary. The ban is, however, considered necessary by some solid waste officials since grass and other yard wastes take up

Table 5.11
Socioeconomic Factors versus Support for Ban of Yard Wastes from Landfills

Variable	**Response Category**	**Support**	**Oppose**	**Total**
Total Sample		49.4	50.6	100.0
Resident	City	48.4	51.6	100.0
	County	52.6	47.4	100.0
Age By Category*	18-25	64.2	35.8	100.0
	26-35	59.8	40.2	100.0
	36-45	55.3	44.7	100.0
	46-55	54.1	45.9	100.0
	56-65	36.7	63.3	100.0
	65+	36.1	63.9	100.0
Education*	College Graduate	56.5	43.5	100.0
	Not College Graduate	44.7	55.3	100.0
Income*	<$12,500	36.8	63.2	100.0
	$12,500-25,000	46.5	53.5	100.0
	$25,000-35,000	54.3	45.7	100.0
	$35,000-50,000	55.8	44.2	100.0
	$50,000+	56.7	43.3	100.0

*denotes significant differences among classes for this variable, based on chi-square test

Table 5.12
Attitude and Behavioral Factors versus Support for Ban of Yard Wastes from Landfills

Variable	Response Category	Support	Oppose	Total
RECTOT*	Respondent is a serious recycler (>= 4 types of materials)	55.25	44.75	100.0
	Respondent is not a serious recycler, (<= 4 types of materials)	44.28	55.72	100.0
DECOMPOS*	Respondent thinks things decompose quickly in landfills	46.65	53.35	100.0
	Respondent does not think things decompose quickly	54.25	45.75	100.0
MEMBER*	Respondent is a member of an environmental protection group	63.39	36.61	100.0
	Respondent is not a member of an environmental protection group	47.27	52.73	100.0
LAWS*	Respondent know that TN law requires a 25% reduction	56.25	43.75	100.0
	Respondent does not know that TN law requires a 25% reduction	48.11	51.89	100.0
COMPTOT	Respondent composts at least one type of material	50.62	49.38	100.0
	Respondent does not compost any materials	48.87	51.13	100.0

*denotes significant differences among classes for this variable, based on chi-square test

valuable landfill space and can be processed into a valuable material through composting. Based on chi-square test results, responses showed significant differences across classes of these variables, with the exception of COMPTOT. This means that those who compost and those who do not did not differ significantly on their support for a landfill ban of yard wastes. This is surprising since one would think that those who actively backyard compost would be more supportive than those who do not.

Attitudes Toward Unit-Pricing

Another specific objective of this survey was to look at residents' attitudes towards economic incentives such as unit-pricing. Unit-pricing is a system where participants are charged for garbage services based on how much they dispose of. This contrasts with the traditional system where participants pay the same amount for garbage services no matter how much they throw away. This fee may be either a bill paid monthly or a portion of tax collections which is ear-marked for garbage services. Out of 361 city residents, only 28.3% responded that they would rather see city garbage services funded through a unit-pricing system. The remainder preferred to see these services funded out of general taxes as they currently are. Out of 419 non-city residents who answered the question, 52.7% responded that they would prefer to see a unit-pricing system for funding of county convenience centers. Of the 191 non-city residents who subscribe to a private hauler 55.0% preferred to see private haulers charge based on volume. Of the entire sample (county and city residents combined) 77.6% believe a unit-pricing system would cause at least some increase in the amount of recycling and composting that occurs in Knox County, while 90.2% believe it would cause an increase in the amount of garbage that is illegally dumped.

CHAPTER VI

MODELS EXPLAINING COMPOSTING BEHAVIOR

Introduction

This chapter addresses the third specific objective of this research project. This objective was to identify factors associated with residents' backyard composting behavior. Models were developed for each individual material: grass, leaves, shrub and tree trimmings, and food wastes. A model was also developed to explain factors associated with whether or not a household composted any type of material.

Conceptual Framework

In order to develop a statistical model to explain composting behavior, a conceptual framework was first developed. At the most basic level, a household makes the decision to compost or not based on the perceived costs and benefits that accrue to its members. Perceived costs may include the amount of time and effort required to compost, the amount of space required, or the potential negative feelings of neighbors or peers. Perceived benefits include, among others, the value end product which can be used as a soil amendment for gardening or landscaping purposes, the feeling of personal satisfaction in knowing you are doing your part in reducing the amount of waste that reaches landfills or conserving natural resources, or the potential positive feelings of neighbors or peers. If a unit pricing system of solid waste funding were in place another household level benefit would be reduced solid waste disposal costs.

The first step in building a framework was to review past research focusing upon explanations for why individuals or households would engage in a particular behavior. This literature review was summarized in an earlier chapter. Drawing heavily on this past research, as well as basic economic theory, broad factor groups were identified which could be expected to influence households' perceptions of benefits and costs of composting, and thus composting behavior. Specific variables representing these factors were then defined from the survey data. The factor groups that were hypothesized in this research to either directly or indirectly influence household composting behavior include the following: behavioral factors, attitudinal factors, peer influence factors, knowledge factors, institutional factors, and socioeconomic factors.

The first factor group that was chosen was behavioral factors. Specific variables that were included in this group were RECTOT, GARDEN, and MEMBER. The RECTOT variable is a dummy variable that indicates whether the household recycles four or more types of materials. It was hypothesized that if the household has a strong commitment to recycling activities then they are more likely to compost. This is based on the assumption that these households recognize the need to divert materials from landfills and are also more likely to be aware of and accept the true household level cost of diversion activities. The household is thus assumed to be more likely to conclude that the benefits to the household and society are higher than the costs associated with diversion. The variable GARDEN indicates whether or not the household has a flower or vegetable garden. Those who garden are assumed to recognize the benefits of composting to their garden. These benefits may be economic incentives in the form of reduced costs associated with fertilizer and other soil amendment

inputs. These households may also have ample free time available to engage in outdoor activities around the home. Those households who garden are hypothesized to be more likely to compost. The variable MEMBER indicates the households membership in organizations dedicated to the protection of the environment. These individuals are assumed to be more aware of the solid waste disposal problem and the need for waste reduction, and thus more likely to compost.

The next factor group includes variables associated with household attitudes. The first variable included in this group is YARDREG, indicating a household's support for a ban on yard wastes from landfills. Those who support a ban are hypothesized to be more aware of the solid waste problem and, therefore more likely to take individual responsibility for the problem through composting behavior. The variable EFFCOMP indicates whether or not the household thinks that composting requires too much effort to be worthwhile. If the household perceives that composting requires too much effort then they are less likely to compost themselves. This may indicate that the household thinks that their efforts will not make a difference. The variable YARDSPAC indicates the household's perception of the amount of space that composting requires. If the household thinks that composting requires too much space then they are hypothesized to be less likely to compost.

The factor group of peer influence includes two variables which attempt to measure the amount of influence that individuals other than the household decision maker have on the decision to compost. The variable COMPOST indicates if the household has friends or family members who compost. If the household does, then it is hypothesized that the household is more likely to compost either because they have more accurate knowledge about the costs

and benefits of composting or they value what others think about their individual behaviors. The variable KIDINT indicates if the household includes school-aged children who have expressed an interest in recycling or composting behavior. If the children have expressed an interest in these types of activities, then it is hypothesized that the household will be more likely to compost. The children may have learned about these types of activities through the educational programs offered in Knox County public schools.

The knowledge group includes more variables than any other. The first variable, DECOMPOS, indicates the household's perception about how quickly materials decompose in landfills. If the household thinks that materials decompose quickly, then they are hypothesized to be less likely to compost. The variable LAWS indicates if the household is aware that the 1991 TN Solid Waste Management Act requires counties to reduce the per capita amount of wastes that goes to Class I landfills by twenty-five percent. If the household has this knowledge, it is hypothesized that the household will be more likely to compost in order to do its part in reaching the goal. The last two variables in this category are MASTER and BINS. These variables indicate if the household is at least somewhat aware of the Master Composter and Recycler Program and the sale of backyard composting bins. It is hypothesized that if the household is familiar with these programs then it is more likely to compost.

The institutional factor group contains only one variable. This variable RESIDENT indicates if the household lies within the city limits of Knoxville. If the household is within the city then they have access to city pick up of yard wastes and thus would seem less likely

to backyard compost. City residents may also be less likely to compost than non-city residents because of less yard space available in more metropolitan areas.

The last factor group includes socioeconomic variables. The variable OWNHOME indicates if the household owns their place of residence. It is hypothesized that home owners would be more likely to compost than renters due to the fact that have a greater sense of permanence in their residence. This sense of permanence may lead to behaviors which are more sustaining of the property. The variable RESPAGE represents a continuous number indicating the actual age of the respondent in years. The relationship of this variable to composting behavior is indeterminate. For example, suppose that you have two individuals, one middle aged and one a senior citizen. If retired, the senior may be more likely to compost than the middle aged individual due to a lower opportunity cost associated with free time. However, in another case the middle aged individual may be more likely to compost due to the increasing awareness of environmental or solid waste management issues or if the senior is in poor health. The variable EDUC indicates if the head of household is a college graduate or not. It is hypothesized that if the head of household is a college graduate then the household is more likely to compost. This assumes that those who are more educated are more aware of solid waste issues and are more likely to have a sense of social responsibility to deal with the problems. The values for the variable RESPINCM represents class data. These classes indicate different levels of income. As the value increases so does the income level. This assumes a linear relationship between income and composting behavior. The income variable is also hypothesized to influence composting behavior in either direction. Suppose that a household has a low income and is at least somewhat self-sufficient, that is,

the household has a vegetable garden in which the household members grow their own food. In this case the household may be more likely to compost their wastes in order to use them as soil enrichment agents in the garden. A household of higher income may instead go out and purchase soil amendments and be less likely to compost. In another case a household of lower income may be forced to work more hours to make ends meet and, therefore, would have less free time in which to engage in composting behavior. Another way that this variable could have been constructed would be to include each income level as a separate dummy variable. Each dummy variable could have a dichotomous outcome indicating if the respondent's income fell within that particular category. By constructing the variable in this manner it would possible to more accurately gauge the true sign of the relationship between income, at each particular level, and composting behavior.

Regression Model Specification

Conventional regression models were not appropriate for this type of survey data due to the fact that the dependent variables required the outcome to be one of two discrete (dichotomous) outcomes, either the household "did" or "did not" compost. Instead, a type of qualitative response (QR) model was chosen in order to handle this "yes/no" type of outcome. In econometric applications a logit probability model for binomial outcomes is quite often used, where the method of estimation is maximum likelihood.

The model type that was chosen is summarized by William Greene in his book titled Econometric Analysis (1990).

$$\text{Prob}(1) = \frac{\exp(\beta'X)}{1+\exp(\beta'X)} = \Lambda(\beta'X)$$

$$\text{Prob}(0) = \frac{1}{1+\exp(\beta'X)} = 1 - \Lambda(\beta'X)$$

where β represents some set of regression coefficients
X represents some set of variables or characteristics
the notation $\Lambda(.)$ indicates the logistic cumulative distribution function, and
$\beta'X = \beta_0 + \beta_1(X_1) + \beta_2(X_2) + \beta_3(X_3) + ... + \beta_n(X_n)$

The marginal effects of a change in the value of one particular variable, X_i, can then be calculated by the following equation:

$$\frac{\partial \text{Prob}(0)}{\partial X} = [\text{Prob}(0)]*[1-\text{Prob}(0)]*\beta$$

Since the particular models that were used in this research project contained dummy variables, calculating the partial derivatives in this manner is not very meaningful. Instead, it is more meaningful to compute the probabilities over the range of $\beta'X$ (using sample estimates) and each of the two values of the binary variable in question.

The null and alternative hypothesis for the models were as follows:

H_0: the probability that a household will compost *is not* related to any of the suggested variables
H_a: the probability that a household will compost *is* related to one or more of the suggested variables

The dependent variables that were used in the regression models are summarized in Table 6.1. Each of these is dichotomous in nature. The dependent variable COMPTOT is

Table 6.1
Summary of Dependent Variables

Dependent Variable Name and Description
COMPTOT: 1=respondent reports that household (hh) composts at least one type of material 0=hh doesn't compost anything
_GRASS: 1=respondent reports that hh actively composts grass trimmings 0=hh does not compost grass trimmings
_LEAVES: 1=respondent reports that household (hh) actively composts leaves 0=hh does not compost leaves
_SHRUB: 1=respondent reports that household (hh) actively composts tree and shrub trimmings 0=hh does not compost tree and shrub trimmings
_FOOD: 1=respondent reports that household (hh) actively composts food scraps 0=hh does not compost food scraps

a dummy variable that was created to capture whether the household reported composting one or more type of organic material (value=1) or whether the household did not report composting any type of organic materials (value=0). The dependent variables _GRASS, _LEAVES, _SHRUB, and _FOOD have a value of 1 if the household reported *actively* backyard composting that particular item and 0 if the household did not. Including the response option of "piling up of materials at the back of the lot" along with "active backyard composting" was briefly considered. While this option can be considered *passive* backyard composting, it was decided that it would be in the best interest of this research to focus strictly on *active* participation.

The independent variables that were used in the regression models are summarized in Table 6.2, as well as the hypothesized relationship between the variable and the probability

Table 6.2
Summary of Independent Variables

Factor Group	**Variable Name /Description**	**Hypothesis**	**Hypothesized Impact***
Behavior	RECTOT: dummy variable which indicates that 1=household (hh) recycles >= 4 items (serious recycler) 0=hh recycles <4 items	if household (hh) recycles multiple items then it is more likely to participate in backyard composting (byc)	(+)
	GARDEN: 1=hh has a vegetable or flower garden 0=hh doesn't have a garden	if hh gardens then it is more likely to participate in byc	(+)
	MEMBER: 1=hh contains individuals that are members of organization(s) dedicated to the protection of the environment 0=otherwise	if hh contains members of these organizations then it is more likely to participate in byc	(+)
Attitude	YARDREG: 1=hh supports ban on yard wastes in landfills 0=otherwise	if hh supports ban then it is more likely to participate in byc	(+)
	EFFCOMP: 1=hh agrees or strongly agrees that byc requires too much effort to be worthwhile 0=otherwise	if hh thinks that composting requires too much effort then it is less likely to participate in byc	(-)
	YARDSPAC: 1=respondent believes that composting requires too much space to be worthwhile 0=otherwise	if hh thinks that composting requires too much space then it is less likely to participate in byc	(-)
Peer Influence	COMPOST: 1=hh has friends or family that byc 0=otherwise	if hh has friends or family that byc then it is more likely to participate in byc	(+)
	KIDINT: 1=if hh has at least one child in grades K-12 that have shown an interest in recycling or composting 0=if hh has no children that have shown an interest	if hh has children that are interested in recycling or composting then the hh is more likely to participate in composting activity	(+)

Knowledge	DECOMPOS: 1=hh believes that most materials break down quickly in landfills 0=otherwise	if hh thinks that most items break down quickly in landfills then it will be less likely to participate in byc	(-)
	LAWS: 1=hh knows that TN law requires that materials being sent to landfills must be reduced by 25% 0=otherwise	if hh knows that law requires reduction then it is more likely to participate in byc	(+)
	MASTER: 1=hh is familiar or very familiar with the Master Recycler and Composter Program offered by Knox County 0=otherwise	if hh is aware that the program exists then it is more likely to have some knowledge of composting and, therefore, more likely to participate in byc	(+)
	BINS: 1=hh is familiar or very familiar with the annual sale of byc bins coordinated by the City of Knoxville 0=otherwise	if hh is aware that the program exists then it is more likely to have some knowledge of composting and, therefore, more likely to participate in byc	(+)
Institutional	RESIDENT: 1=hh is located inside the city limits 0=otherwise	if hh is located inside the city limits then they are considered to be more urban and, therefore, less likely to participate in byc	(-)
Socioeconomic	OWNHOME: 1=hh owns their dwelling place 0=otherwise	if hh owns their own home then they are more likely to participate in byc	(+)
	RESPAGE: actual age of respondent	the effect of age is considered indeterminate	(+/-)
	EDUC: 1=respondent is at least a college graduate 0=otherwise	if respondent (assumed to be adult decision maker) then the hh is more likely to participate in byc	(+)
	RESPINCM: 1= < $12,500 2=$12,500-$25,000 3=$25,000-$35,000 4=$35,000-$50,000 5= > $50,000	the effect of income is considered indeterminate	(+/-)

*Note that the Hypothesized Impact is the impact on the probability that the household *will* compost based on a change from value=0 to value=1

that the household *will* participate in that particular composting behavior. All variables are binary in nature with the exception of RESPAGE and RESPINCM. Note that the hypothesized relationship of these two variables is indeterminate. That is, these variables represent characteristics which could logically influence composting behavior in either direction. The variables RECTOT, GARDEN, YARDREG, COMPOST, LAWS, MASTER, BINS, MEMBER, KIDINT, OWNHOME, and EDUC are all expected to have a positive relationship with composting behavior. That is, if the value of one of these variables is changed from a 0 to a 1, all other variables held constant, then it is hypothesized that the household will be *more* likely to engage in composting behavior. The variables EFFCOMP, YARDSPAC, DECOMPOS, and RESIDENT are hypothesized to have a negative relationship with composting behavior. This means that if the value in these variables is changed from a 0 to a 1, all other variables held constant, then the household is *less* likely to compost.

Results

The logit probability models were estimated using the PROC LOGISTIC procedure in the SAS software package. This procedure was used in order to handle the binary nature of the dependent variables. While the dependent variable, the variable whose behavior is to be explained, is different in each model the same independent variables were used for each.

The results for each model are summarized in the following tables. The first four summarize the results for the models explaining each specific type of compostable material. The last summarizes the results for the model which explains whether or not the household composts at least one type of material.

The tables provide the parameter estimates, the Wald Chi-square, the confidence level at which the variable is significant based on its Chi-square value, and the change in probability given a change in the parameter estimate from 0 to 1 (for that particular variable). Also included are the measures of prediction success, the number of observations that the model used in the estimations, and the log likelihood score. The log likelihood score measures the significance of the logit function. Since this calculated value is highly significant in all models, the null hypothesis can be rejected and the conclusion can be drawn that the probability that a household will compost *is* related to one or more of the included variables. With respect to measures of prediction success, each of the five models correctly predicted behavior for 75-80% of the respondents.

Interpretation of the probability column of the tables is as such: the change in probability represents the change in the probability that the event will occur, given a one unit change in the parameter, *ceteris paribus* (Pindyck and Rubinfeld, 1976). In the following models a one unit change will indicate a change in the base value of the parameter from 0 to 1. For example, in Table 6.3 the probability calculated for the variable COMPOST is 0.0896. This means that if the base value of the parameter is changed from 0 (the household *does not* have friends or family that compost) to 1 (the household *does* have friends or family that compost), *ceteris paribus,* then the probability that the household composts tree and shrub trimmings increases by 8.9%.

Four variables were found to have a significant relationship with the probability that a household would compost tree and shrub trimmings (for complete results see Table 6.3). The first variable which appears to influence the probability that a household composts tree

Table 6.3
Shrub and Tree Trimmings Composting Model: Logit Regression Results

Variable	Parameter Estimate	Wald Chi-Square	Pr > Chi-Square	Probability *
INTERCPT	-3.3855	12.3288	0.0004	0.5771
RECTOT	-0.0978	0.1093	0.7410	-0.0049
GARDEN	0.8179	3.5099	0.0610	0.0298
YARDREG	-0.1078	0.1290	0.7194	-0.0054
EFFCOMP	-1.0876	3.5327	0.0602	-0.0356
YARDSPAC	-0.3515	0.2740	0.6007	-0.0155
COMPOST	1.0686	10.5043	0.0012	0.0896
DECOMPOS	0.1892	0.4039	0.5251	0.0107
LAWS	0.2180	0.3606	0.5482	0.0126
MASTER	0.2094	0.2669	0.6054	0.0119
BINS	0.5622	3.5537	0.0594	0.0373
MEMBER	0.1186	0.1124	0.7375	0.0065
OWNHOME	0.6438	1.1374	0.2861	0.0251
EDUC	0.3653	1.3743	0.2411	0.0226
RESIDENT	-0.3850	1.6482	0.1992	-0.017
KIDINT	0.2463	0.6169	0.4322	0.0145
RESPINCM	0.0211	0.0230	0.8795	0.001
RESPAGE	-0.0160	2.0148	0.1558	-0.001
%concordant	76.7			
%disconcordant	22.9			
%tied	0.4			
Log likelihood score	48.603(p=0.0001)			
#observations	531			

Note: shaded areas denote variables significant at the 0.10 confidence level
*The values listed represent the change in probability that a household composts due to a one-unit increase in the individual variable.

and shrub trimmings is GARDEN. The probability that a household composts tree and shrub trimmings increases by 2.98% if the household has either a vegetable or flower garden. The value for the change in probability of the EFFCOMP variable indicates that if the household *does agree* that composting requires too much effort to be worthwhile then the probability that the household composts tree and shrub trimmings decreases by 3.56%. The probability that the household composts these items increases by 8.96% if the household has friends or family members that compost. The probability that a household composts tree and shrub trimmings increases by 3.73% if the household is at least somewhat familiar with the City of Knoxville's program which sells backyard composting bins at low cost. The relationships of these significant variables to the probabilities are all as expected (refer to Table 6.2 for hypothesized impact).

For the model explaining the household's decision to compost grass clippings there were six variables which showed significant influence (see Table 6.4 for complete results). The probability that a household composts grass increases by 8.28% if the household has a vegetable or flower garden. The probability of composting grass decreases by 7.97% if the household perceives that composting requires too much effort to be worthwhile. The probability of composting increases by 10.38% the household has friends or family that compost. The probability also increases if the household has knowledge that the 1991 TN Solid Waste Management Act requires a 25% waste reduction, by 9.18%. The probability that a household composts grass increases by 8.36% if the household owns their home. The value for the change in probability for the RESPAGE variable is -0.0021. This indicates that as the respondent increases in age by one year, the household is .21% less likely to compost

Table 6.4
Grass Composting Model: Logit Regression Results

Variable	Parameter Estimate	Wald Chi-Square	Pr > Chi-Square	Probability *
INTERCPT	-2.7090	11.0005	0.0009	0.5546
RECTOT	0.2919	1.3661	0.2425	0.0347
GARDEN	1.2232	10.7048	0.0011	0.0828
YARDREG	-0.1465	0.3385	0.5607	-0.0152
EFFCOMP	-1.1439	6.1540	0.0131	-0.0797
YARDSPAC	-0.3224	0.3489	0.5547	-0.0304
COMPOST	0.7364	8.1583	0.0043	0.1038
DECOMPOS	-0.0518	0.0413	0.8390	-0.0053
LAWS	0.6689	5.0595	0.0245	0.0918
MASTER	-0.1798	0.2374	0.6261	-0.0181
BINS	0.2661	1.0463	0.3064	0.0321
MEMBER	-0.0408	0.0183	0.8925	-0.0042
OWNHOME	1.2396	5.1325	0.0235	0.0836
EDUC	0.4147	2.4060	0.1209	0.0513
RESIDENT	-0.1408	0.3157	0.5742	-0.0143
KIDINT	0.2335	0.7342	0.3915	0.0269
RESPINCM	-0.1753	2.2232	0.1360	-0.0181
RESPAGE	-0.0164	3.1744	0.0748	-0.0021
%concordant	75.7			
%disconcordant	24.0			
%tied	0.3			
Log likelihood score	62.226(p=0.0001)			
#observations	506			

Note: shaded areas denote variables significant at the 0.10 confidence level
*The values listed represent the change in probability that a household composts due to a one-unit increase in the individual variable.

grass. The direction of the hypothesized relationships were all correct for the significant variables.

The results for the model of food composting are reported in Table 6.5. These results show that eight variables are significant related to the probability that a household will compost food wastes. If a household has a serious commitment to recycling (i.e. recycles four or more types of materials recycled) then the probability that they will compost food wastes increases by 3.49%. The link between commitment to recycling and composting may be exhibited here since those who compost their food wastes can be considered "serious" composters as well. If a household has a garden, then the probability that the household compost food wastes increases by 2.29%. The next significant variable is YARDREG. The results here are contrary to what was hypothesized. The model results show that if the household supports a ban of yard wastes and other organic matter from landfills, then the probability that the household will compost food wastes decreases by 1.45%. It was hypothesized that the relationship between the probability that a household would compost and this variable would be positive. The probability that a household will compost food wastes decreases by 2.66% if the household believes that composting requires too much effort to be worthwhile. This is consistent with the previous models. If the household has friends or family that composts, the probability that the household composts food wastes increases by 5.79%. The probability also increases by 2.99% if the household is aware of the TN law requiring that waste disposed of in landfills be reduced. If the household is aware of the bin sale program, the probability that the household composts food wastes increases by 3.89%. Finally, the variable that indicates if the head of household is a college graduate is also

Table 6.5
Food Composting Model: Logit Regression Results

Variable	Parameter Estimate	Wald Chi-Square	Pr > Chi-Square	Probability *
INTERCPT	-3.4946	12.6901	0.0004	0.51
RECTOT	0.7304	4.7140	0.0299	0.0349
GARDEN	1.0936	4.3877	0.0362	0.0229
YARDREG	-0.5452	2.7478	0.0974	-0.0145
EFFCOMP	-1.4550	3.4634	0.0627	-0.0266
YARDSPAC	-1.0893	1.0119	0.3144	-0.0229
COMPOST	1.0404	8.4472	0.0037	0.0579
DECOMPOS	0.2001	0.3702	0.5429	0.0074
LAWS	0.6513	2.9123	0.0879	0.0299
MASTER	-0.2909	0.4278	0.5130	-0.0086
BINS	0.7938	5.9695	0.0146	0.0389
MEMBER	0.5658	2.5810	0.1082	0.0252
OWNHOME	0.0144	0.0006	0.9798	0.0003
EDUC	0.6178	3.0720	0.0797	0.0281
RESIDENT	-0.2141	0.4268	0.5136	-0.0064
KIDINT	0.3575	1.0511	0.3053	0.0144
RESPINCM	-0.2320	2.3403	0.1261	-0.007
RESPAGE	-0.00416	0.1229	0.7259	0.0
%concordant	80.8			
%disconcordant	18.8			
%tied	0.4			
Log likelihood score	56.540(p=0.0001)			
#observations	533			

Note: shaded areas denote variables significant at the 0.10 confidence level
*The values listed represent the change in probability that a household composts due to a one-unit increase in the individual variable.

positively related to composting of food wastes. This means that if the head of the household is a college graduate, then the probability that the household composts is increased by 2.81%. With the exception of the YARDREG variable, all of the hypothesized impacts on the probabilities are as expected.

The results of the regression model for leaves are summarized in Table 6.6. As in the previous models the impact of GARDEN is positive. This means that if the household gardens, the probability that the household composts leaves increases by 8.27%. The probability that the household composts leaves in decreased by 8.14% if the household believes that composting requires too much effort to be worthwhile. The probability decreases by another 9.77% if the household thinks that composting requires too much space to be worthwhile. This model was the only one in which this variable was significant. The probability increases by 13.31% if the household has friends or family members who compost. The probability increases by 8.89% if the household owns their home. In this model the variable KIDINT was also significant. This means that the probability that the household composts leaves is increased by 7.08% if the household contains children who have expressed an interest in composting or recycling behavior. In this model another unique variable came into significance. This variable was RESPINCM. This indicated that the probability that a household composts leaves decreases by 2.29% for an increase in income level by one unit. The income level units are defined in Table 6.2.

The results summarized in Table 6.7 indicate the probability that a household composts one or more type of material. The probability that a household composts is increased by 7.43% if the household has a serious commitment to recycling (recycles four or

Table 6.6
Leaves Composting Model: Logit Regression Results

Variable	Parameter Estimate	Wald Chi-Square	Pr > Chi-Square	Probability *
INTERCPT	-2.8188	13.5756	0.0002	0.5984
RECTOT	0.3551	2.0765	0.1496	0.0524
GARDEN	0.8797	6.9590	0.0083	0.0827
YARDREG	-0.0287	0.0136	0.9073	-0.0038
EFFCOMP	-0.8614	4.0298	0.0447	-0.0814
YARDSPAC	-1.1400	3.0483	0.0808	-0.0977
COMPOST	0.8017	10.0487	0.0015	0.1331
DECOMPOS	-0.0208	0.0071	0.9327	-0.0026
LAWS	0.3089	1.0344	0.3091	0.0428
MASTER	0.1800	0.2661	0.6060	0.0247
BINS	0.1078	0.1745	0.6761	0.0147
MEMBER	-0.1778	0.3432	0.5580	-0.0218
OWNHOME	0.9831	4.0766	0.0435	0.0889
EDUC	0.3269	1.5429	0.2142	0.0475
RESIDENT	0.0391	0.0254	0.8734	0.0052
KIDINT	0.4673	2.8957	0.0888	0.0708
RESPINCM	-0.1928	2.9865	0.0840	-0.0229
RESPAGE	0.00049	0.0031	0.9557	0.0
%concordant	74.8			
%disconcordant	24.9			
%tied	0.3			
Log likelihood score	60.618(p=0.0001)			
#observations	469			

Note: shaded areas denote variables significant at the 0.10 confidence level
*The values listed represent the change in probability that a household composts due to a one-unit increase in the individual variable.

Table 6.7
General Composting Model: Logit Regression Results

Variable	Parameter Estimate	Wald Chi-Square	Pr > Chi-Square	Probability *
INTERCPT	-3.1360	20.0541	0.0001	0.6429
RECTOT	0.3846	2.9583	0.0854	0.0743
GARDEN	1.0345	11.6819	0.0006	0.1344
YARDREG	-0.2501	1.2111	0.2711	-0.0415
EFFCOMP	-1.0407	7.3542	0.0067	-0.1353
YARDSPAC	-0.7633	2.3607	0.1244	-0.108
COMPOST	0.9423	17.0255	0.0001	0.2039
DECOMPOS	-0.1453	0.4006	0.5268	-0.0256
LAWS	0.1898	0.4461	0.5042	0.0355
MASTER	-0.0690	0.0424	0.8369	-0.0122
BINS	0.4471	3.5895	0.0581	0.0893
MEMBER	0.3321	1.4327	0.2313	0.0638
OWNHOME	0.9676	4.7828	0.0287	0.129
EDUC	0.5259	4.8227	0.0281	0.107
RESIDENT	-0.0278	0.0150	0.9025	-0.0053
KIDINT	0.0546	0.0450	0.8321	0.009
RESPINCM	-0.1364	1.7450	0.1865	-0.024
RESPAGE	0.00602	0.5328	0.4654	0.0018
%concordant	78.0			
%disconcordant	21.8			
%tied	0.2			
Log likelihood score	99.563(p=0.0001)			
#observations	533			

Note: shaded areas denote variables significant at the 0.10 confidence level
*The values listed represent the change in probability that a household composts due to a one-unit increase in the individual variable.

more types of materials). The probability increases by 13.44% if the household has a vegetable or flower garden. The probability that a household composts is decreased by 13.53% if the household thinks that composting requires too much effort to be worthwhile. The probability increases by 20.39% if the household had friends or family members that compost. If the household is aware of the city's compost bin sale then the probability of being a composter increases by 8.93%. The probability increases by 12.9% if the household owns their own home. The probability increases by 10.7% if the head of household is a college graduate. In this model all of the hypothesized impacts are as expected.

CHAPTER VII

CONCLUSIONS

Summary of Results

Much information was gained about the behavior and attitudes of Knox County residents who reside in single family dwellings. This information is of particular interest to Knox County solid waste officials.

Ninety-five percent of households sampled dispose of their household solid waste through city pick-up (43.6%), private subscription service (25.5%), or use of the county convenience centers (26.6%). While only 46.4% of Knox County residents sampled report a serious commitment to recycling (recycling four or more types of materials), 79.7% report recycling at least one type of materials. The highest percentages of items recycled are aluminum cans, newspapers, plastic, glass, steel and tin cans, cardboard, and other paper products, respectively. Of these recycled items, 48.3% are dropped off at either the city recycling drop off sites (25.8%) or the county convenience center recycling drop off sites (22.5%).

While 27.9% of households sampled report composting at least one type of organic material, the break down of individual materials reflects that residents vary in which material type they compost. For grass, leaves, tree and shrub trimmings, and food wastes, 20.2%, 22.7%, 10.8%, and 9.5% of the households sampled reported actively composting each type of material, respectively. Although these percentages may not appear very high in themselves, it is important to note that when you look at all possible disposal methods available to

residents, only 3.6% of households dispose of grass in a manner which reaches landfills, 7.5% of households dispose of leaves in a manner which reaches landfills, 11.0% of households dispose of tree and shrub trimmings in a manner which reaches landfills, and 37.8% of households dispose of food wastes in a manner which reaches landfills. The remainder are diverted through city pick up (the city actively composts these items), active or passive backyard composting methods or other methods.

Most residents that were sampled were not familiar with the county educational programs that are currently used to encourage composting activities. Only 20.9% reported awareness of the educational programs that are offered in local schools, 9.4% were aware of the Master Composter and Recycle Program, 12.2% were aware of the mobile display unit, and 26.6% were aware of the composting bin sale program.

Factors or characteristics of residents which affected their support for a ban of yard wastes from landfills included age, education (college graduate or not), income, commitment to recycling, perception of decomposition that occurs in landfills, and knowledge of current solid waste laws.

Also of importance to this survey was residents' support for a unit pricing system of solid waste disposal funding. It was found that 28.3% of city residents sampled and 52.7% of non-city residents sampled preferred to see a unit pricing system implemented. The remainder preferred the current system in which garbage disposal is funded out of general tax revenues.

Factors which significantly influenced a household's decision to compost individual materials as well as a general model which explains whether the household composts at least

one type of material (but did not specify which type) are summarized in Table 7.1. Factors which were significant in *all* models included whether or not the household had a garden of some kind, the household's perception of the amount of effort that composting required, and the influence of peers (in the form of friends or family). Resident awareness of the bin sale program significantly influenced the probability of composting tree and shrub trimmings, food wastes, and composting in general but not grass of leaf composting. Home ownership was also significant in three of the five models. The three that this variable influenced were grass composting, leaf composting, and composting in general. Commitment to recycling influenced the model which explained food composting and composting in general, but not the other models. Awareness of the 1991 TN Solid Waste Management Act influenced the probability of grass and food composting, while education influenced food composting and composting in general. Whether the household supported a ban of yard wastes from landfills was significant only in the food model, and in the opposite direction than was expected. Whether the household contained children that have expressed an interest in recycling and composting behavior influenced only the leaf composting decision as did income level. Perceptions about the amount of yard space that was required of composting only influenced the probability that a household would compost leaves. Finally the respondents' age influenced only the decision to compost grass clippings. Other variables which were hypothesized to influence the composting decision of households were perceptions about decomposition rates in landfills, awareness of the Master Composter and Recycle Program,

Table 7.1
Summary of Probability Values from Logit Regression Models of Composting Behavior

	SHRUB	GRASS	FOOD	LEAVES	COMPTOT
INTERCPT	0.5771	0.5546	0.51	0.5984	0.6429
RECTOT			0.0349		0.0743
GARDEN	0.0298	0.0828	0.0229	0.0827	0.1344
YARDREG			-0.0145		
EFFCOMP	-0.0356	-0.0797	-0.0266	-0.0814	-0.1353
YARDSPAC				-0.0977	
COMPOST	0.0896	0.1038	0.0579	0.1331	0.2039
DECOMPOS					
LAWS		0.0918	0.0299		
MASTER					
BINS	0.0373		0.0389		0.0893
MEMBER					
OWNHOME		0.0836		0.0889	0.129
EDUC			0.0281		0.107
RESIDENT					
KIDINT				0.0708	
RESPINCM				-0.0229	
RESPAGE		-0.0021			
%concordant	76.7	75.7	80.8	74.8	78.0
%disconcordant	22.9	24.0	18.8	24.9	21.8
%tied	0.4	0.3	0.4	0.3	0.2
Log likelihood score	48.603(p= 0.0001)	62.226(p= 0.0001)	56.540(p= 0.0001)	60.618(p= 0.0001)	99.563(p= 0.0001)
#observations	531	506	533	469	533

probability values are only included for variables significant at the 0.10 confidence level
*The values listed represent the change in probability that a household composts due to a one-unit increase in the individual variable.

membership in organizations dedicated to the protection of the environment, and whether the household resided within the city limits. These variables were not significant in explaining the probability that a household would compost any types of materials.

Implications of Findings

All of the information from this survey has implications and or usefulness to Knox County solid waste officials and potential policy implications. The data can be used to develop future solid waste policies and strategies. For instance it was shown in Table 5.11 that all individual age groups up to age 55 generally support a ban of yard wastes from landfills. This table suggests that programs are needed to educate persons age 55 and over about the importance of a ban. It is also important to note that the county *overall* is split almost in half over the idea of a ban. Having the knowledge that this survey provided, Knox County officials would now be more able to target educational programs where they are needed most. If Knox County officials have knowledge of the proportion of residents who support or oppose certain policies or actions, as well as the strength of their support or opposition, decision makers can attempt to determine the political feasibility of proposed policies. For instance, even if 80% of residents mildly support a proposed ban of yard wastes from landfills, if another 10% vigorously oppose this action a ban may not be politically feasible .

Another important finding of the survey was that relatively low percentages of residents are aware of the current programs aimed at encouraging composting in Knox County. It is surprising that such a high percentage (27.9%) of the sample reported composting at least one item with relatively little knowledge of these programs. This suggests

that if more information were made available to residents about composting encouragement programs, the percentage of residents who participate in this type of behavior would likely increase.

With regard to Knox County's plan to build a central composting facility the data showed that barely one-half of non-city residents would be willing to take materials to this facility. Even less (39.8% of those who would take materials to this facility) would be willing to pay for this service. This suggests that if the county were planning to fund this service with user fees from households only, there may not be enough volume for the facility to be economically efficient. However, county officials have indicated that the bulk of the funding is to come from fees collected from commercial landscapers and land developers.

City and non-city residents differed dramatically with regard to support for a unit pricing system to fund solid waste services. While 52.7% of non-city residents preferred this type of system, only 28.3% of city residents supported it. This suggests that more effort is necessary to educate residents, especially city residents, on the merits of unit pricing before attempting to implement such a system. It is also important to recognize that approximately 90% of households sampled believed that a unit pricing system would increase the amount of illegal dumping of wastes that occurs in the county. Thus, plans for implementation of a unit pricing system would have to include strategies to combat the potential increase in illegal dumping.

The results of the logit models indicate that different factors influence the decision to compost each individual type of material. While this may indicate that different strategies are needed in order to encourage composting of each material, it may conversely indicate that it

is necessary to educate residents that composting of each item is not mutually exclusive. Once one has started a compost pile and has the general knowledge necessary, any type of organic material can be added.

The fact that the variable COMPOST, which indicates if the household has friends or family that composts, was significant in each of the models indicates that households are definitely more likely to compost if their peers compost. One thing that the county might want to do is create some kind of program which identifies composters to the community. If the community members are made aware that others are composting, then they are more likely to express an interest in composting. The idea is to get a "buzz" around town that "everyone is doing it". A media blitz could be implemented simultaneously which tells where information about composting can be found.

Suggestions for Further Research

It might be suggested that while the focus of this study has been on active composting, the more relevant consideration from the standpoint of Knox County's progress toward meeting the state's 25% goal is diversion from landfills. Therefore, activities such as grasscycling are equally effective in keeping material out of landfills and should be encouraged. From the information gained in this survey it is apparent that approximately 51.5% of households leave grass clippings on their lawn and mow over them with the next lawn cutting and 28.3% of households leave leaves on the lawn. It would be interesting to know what motivates this behavior. Is it because residents know that this process can be beneficial to the health and growth of their lawn? Or is it simply because it is the easiest option available to them?

While this study focused on the percentage of households which exhibited various behaviors, especially with regard to organic disposal, the next step would be to attempt to identify the percentage of each type of organic material (in volume) that is disposed of in various ways. This type of study would recognize the fact that households vary in the amount and type of organic materials generated. This study would yield even *more* useful information to solid waste officials, however, it would be extremely cost and labor intensive to complete.

In this study household attitudes and perceptions toward policy actions, such as a ban of yard wastes from landfills, were solicited. It would be interesting to ask households directly what their response to this policy action would be. Would the household be likely to start composting? Other policy questions of interest include the household response to the backyard composting bin sale and household level response to a unit pricing system. While knowing what the household thinks about the policy is important, this information is only collected in order that solid waste officials can try to predict what household responses would be. By asking the household directly, the solid waste officials would not have to speculate.

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APPENDICES

APPENDIX A

Q:INTRO
T:
Hi, My name is _____, and I am calling from the Social Science Research Institute at the University of Tennessee. We're conducting a survey to find out what people in Knox County think about garbage disposal, recycling, and composting. The survey will take about ten minutes and all your responses will be confidential. Are you 18 or older? [Ask for someone over 18 and repeat first part] Do you mind if I ask you a few questions?
1 CONTINUE OTHER CTRL/END

Q:RESTYPE

Do you live in a single family dwelling?
[SINGLE FAMILY DWELLING IS A HOUSE - NOT AN APARTMENT BUILDING OR CONDO]

1 YES
2 NO

Q:RESPSEX
DO NOT READ...

1 MALE
2 FEMALE

Q:RESIDENT
Do you live inside the city limits of Knoxville?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:INTRO1
Now I'd like to ask what your household does with recyclables and other things such as food scraps, grass clippings, tree trimmings, etc.. Does your household regularly recycle any of the following items?

Q:ALUMCAN
ALUMINUM CANS?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:STEELCAN
STEEL AND TIN CANS?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:PLASTIC
PLASTIC?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:GLASS
GLASS?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:PAPERS
NEWSPAPERS?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:CARDBORD
CARDBOARD?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:PAPPROD
OTHER PAPER PRODUCTS?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:OTHITEM
ANY OTHER ITEMS?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:OTHTYPE
WHAT ITEM(S) WOULD THAT BE?

Q:INTRO2
Now I would like to ask you about how you dispose of a number of household items. Please tell me the primary method you use to dispose of the following items.

Q:GARBAGE
How do you dispose of household garbage?
DO NOT READ OPTIONS - CHOOSE ONLY ONE
1 City pick-up
2 Subscribe for collection service from private hauler (C O U N T Y RESIDENTS)
3 Drop-off garbage at a county convenience center (county run dump site)
4 Burn
5 Bury
6 Other
8 Not Sure
9 Refused

Q:RECYCLE
Recyclables?

DO NOT READ OPTIONS - CHOOSE ONLY ONE

1 Private hauler picks up at curb
2 Drop-off at a county convenience center (county run dump site)
3 City drop-off site
4 Take to processor of recyclables
5 Don't recycle
6 Other, please specify
8 Not Sure
9 Refused

Q:GRASS
Grass clippings?

DO NOT READ OPTIONS - CHOOSE ONLY ONE

01 Left on lawn to mow over next time
02 City pick-up (unbagged)
03 Private subscription pick-up (bagged)
04 Drop-off at a convenience center drop-off (county run dump site)
05 Active backyard composting
06 Piled up at back of lot
07 Burning
08 Don't generate
09 Other, please specify
10 NOT SURE
11 REFUSED

Q:LEAVES
Leaves?

DO NOT READ OPTIONS - CHOOSE ONLY ONE

01 Left on lawn to mow over next time
02 City pick-up (unbagged)
03 Private subscription pick-up (bagged)
04 Drop-off at a convenience center drop-off (county run dumpsite)
05 Active backyard composting
06 Piled up at back of lot
07 Burning
08 Don't generate
09 Other, please specify
10 NOT SURE
11 REFUSED

Q:SHRUB
Tree and shrub trimmings?

DO NOT READ OPTIONS - CHOOSE ONLY ONE

01 City pick-up (unbagged)
02 Private subscription pick-up (bagged)
03 Drop-off at a convenience center drop-off (county run dumpsite)
04 Active backyard composting
05 Piled up at back of lot
06 Burning
07 Don't generate
08 Other, please specify
09 NOT SURE
10 REFUSED

Q:FOOD
Food scraps?

DO NOT READ OPTIONS - CHOOSE ONLY ONE

1 Active backyard composting
2 Throw out with household garbage
3 Feed to livestock or pets
4 Put down garbage disposal
5 Other, please specify
8 NOT SURE
9 REFUSED

Q:YARDREG
Yard waste collected by the City of Knoxville is currently composted or mulched for reuse. However, yard waste collected outside the city limits is disposed of in landfills.

Would you support or oppose regulations that would ban the disposal of yard wastes in landfills?

1 SUPPORT
2 OPPOSE
8 NOT SURE
9 REFUSED

Q:YARDSUPP
Do you strongly support this regulation?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:YARDOPP
Do you strongly oppose this regulation?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:FACILTY
Knox County has recently purchased land near the junction of Oak Ridge Highway and Pellissippi Parkway to establish a central facility for composting and mulching of yardwastes for reuse.

How willing would you be to take yard waste to this central facility?

[READ CHOICES]

1 Very willing
2 Somewhat willing
3 Not willing
8 Not Sure
9 Refused

Q:PAYFEE
How willing would you be to pay a $1 per carload or $2 per truckload fee for this service?

[READ CHOICES]

1 Very willing
2 Somewhat willing
3 Not willing
8 Not Sure
9 Refused

Q:TRANSPRT
How willing would you be to take yard wastes to the nearest county convenience center dump site so it can be transported to the county's central facility?

[READ CHOICES]

1 Very willing
2 Somewhat willing
3 Not willing
8 Not Sure
9 Refused

Q:INTRO3
Next I would like to ask some questions about how you believe garbage services should be paid for.

Q:CITYGARB
Which of the following statements best describes how garbage and recycling services should be paid or?
1 The City of Knoxville should pay for garbage pickup and recycling services out of property tax revenues.
2 People should pay for these services based on how much garbage they throw away.
8 Not Sure
9 Refused

Q:CNTYGARB
Which of the following statements best describes how garbage and recycling services should be paid for?
[READ CHOICES]
1 Knox County should pay for garbage and recycling services at its dump sites out of property tax revenues.
2 People should pay for these services based on how much garbage they throw away.
8 Not Sure
9 Refused

Q:VOLUME
If residents were charged based on how much garbage they throw away, do you think this would cause no increase, some increase, or a large increase in recycling and composting?

1 No increase
2 Some increase
3 Large increase
8 Not Sure
9 Refused

Q:ILLEGDMP
If residents were charged based on how much garbage they throw away, do you think this would cause no increase, some increase, or a large increase in illegal dumping of household garbage?

1 No increase
2 Some increase
3 Large increase
8 Not Sure
9 Refused

Q:PRIVCHRG
Suppose that private garbage haulers were to start charging based on how much garbage that their customers throw away. Would you support or oppose such a change?

1 Support
2 Oppose
8 Not Sure
9 Refused

Q:CHARGSUP
Would you strongly support such a change?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:CHARGOPP

Would you strongly oppose such a change?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:CNTYDIST
How many minutes would you have to drive to get to the nearest Knox County convenience center dump site?

1 5 minutes or less
2 6-10 minutes
3 11-15 minutes
4 Over 15 minutes
8 Not Sure
9 Refused

Q:CITYDIST
How many minutes would you have to drive to get to the nearest city drop-off site for recyclables?

1 5 minutes or less
2 6-10 minutes
3 11-15 minutes
4 Over 15 minutes
8 Not Sure
9 Refused

Q:SUBDIV
Do you live in a subdivision or an area with homes close together?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:RULES
Are there any subdivision rules against backyard composting?

1 Yes
2 No
8 Not Sure
9 Refused

Q:UPSET
Would you be upset if your neighbor began to backyard compost?

1 Yes
2 No
8 Not Sure
9 Refused

Q:COMPOST
Do any of your friends or extended family members backyard compost?

1 Yes
2 No
8 Not Sure
9 Refused

Q:GARDEN
Does anyone in your household practice vegetable or flower gardening?

1 Yes
2 No
8 Not Sure
9 Refused

Q:GARDTYPE
Which one or both?

1 Vegetable
2 Flower
3 Both
8 Not Sure
9 Refused

Q:COMMORG
Is anyone in your household currently involved in any community organizations?

1 Yes
2 No
8 Not Sure
9 Refused

Q:ORGTYPE
In which organization is this person most active?

Q:MEMBER
Are you or anyone in your household currently a member of any organization dedicated to protecting the environment?

1 Yes
2 No
8 Not Sure
9 Refused

Q:CONTRIB
Have you or anyone in your household made a financial contribution to an organization dedicated to protecting the environment in the last 12 months?

1 Yes
2 No
8 Not Sure
9 Refused

Q:INTRO4
Do you generally agree or disagree with the following statements.

Q:DECOMPOS
Most materials other than glass, metals, and plastics break down rather quickly in landfills.

{Follow up with} Do you strongly agree/disagree?

1 STRONGLY DISAGREE
2 DISAGREE
3 AGREE
4 STRONGLY AGREE
8 NOT SURE
9 REFUSED

Q:SOCPROB
Reducing the amount of garbage that goes to landfills is important.

{Follow up with} Do you strongly agree/disagree?

1 STRONGLY DISAGREE
2 DISAGREE
3 AGREE
4 STRONGLY AGREE
8 NOT SURE
9 REFUSED

Q:STORAGE
Recycling requires too much storage space to be worthwhile.

[Follow up with] Do you strongly agree/disagree?

1 STRONGLY DISAGREE
2 DISAGREE
3 AGREE
4 STRONGLY AGREE
8 NOT SURE
9 REFUSED

Q:EFFRECYC
Recycling requires too much effort to be worthwhile.

{Follow up with} Do you strongly agree/disagree?

1 STRONGLY DISAGREE
2 DISAGREE
3 AGREE
4 STRONGLY AGREE
8 NOT SURE
9 REFUSED

Q:EFFCOMP
Backyard composting requires too much effort to be worthwhile. {Follow up with} Do you strongly agree/disagree?

1 STRONGLY DISAGREE
2 DISAGREE
3 AGREE
4 STRONGLY AGREE
8 NOT SURE
9 REFUSED

Q:YARDSPAC
Backyard composting requires too much yard space to be worthwhile.

{Follow up with} Do you strongly agree/disagree?

1 STRONGLY DISAGREE
2 DISAGREE
3 AGREE
4 STRONGLY AGREE
8 NOT SURE
9 REFUSED

Q:LAWS
We're almost finished with the survey. To the best of your knowledge, which of the following statements is most accurate?

[READ FIRST FOUR CHOICE]

1 State law requires all counties to reduce the amount of garbage they dispose of in landfills by 25%.
2 State law bans yardwastes from landfills.
3 State law requires counties to implement a system where residents pay for garbage disposal services based on how much they throw away.
4 There is currently no state law requiring counties reduce the amount of garbage they dispose of in landfills.
8 NOT SURE
9 REFUSED

Q:INTRO5
Next I'm going to read you a list of local programs designed to encourage backyard composting. For each one I read, I'd like you to tell me if you are not familiar, somewhat familiar or very familiar with it.

Q:SCHOOLS
Educational programs about composting in local schools?

1 VERY FAMILIAR
2 SOMEWHAT FAMILIAR
3 NOT AT ALL FAMILIAR
8 NOT SURE
9 REFUSED

Q:BAGIT
Don't Bag It campaign?

1 VERY FAMILIAR
2 SOMEWHAT FAMILIAR
3 NOT AT ALL FAMILIAR
8 NOT SURE
9 REFUSED

Q:MASTER
Master Composter Training Program?

1 VERY FAMILIAR
2 SOMEWHAT FAMILIAR
3 NOT AT ALL FAMILIAR
8 NOT SURE
9 REFUSED

Q:ONWHEEL
"Composter On Wheels" mobile display unit?

1 VERY FAMILIAR
2 SOMEWHAT FAMILIAR
3 NOT AT ALL FAMILIAR
8 NOT SURE
9 REFUSED

Q:DROPSWAP
Drop and Swap of yard waste?

1 VERY FAMILIAR
2 SOMEWHAT FAMILIAR
3 NOT AT ALL FAMILIAR
8 NOT SURE
9 REFUSED

Q:BINS
Sale of backyard composting bins at low cost?

1 VERY FAMILIAR
2 SOMEWHAT FAMILIAR
3 NOT AT ALL FAMILIAR
8 NOT SURE
9 REFUSED

Q:HHNUMBER
Finally, I need to ask you a few background questions. Remember, all your responses are confidential. How many persons are currently living in your household?[USE 99 = REFUSED]

Q:KIDINHH
Are any of these children in school grades K-12?

1 YES
2 NO
8 NOT SURE
9 REFUSED

Q:KIDNUM
How many are in school grades K-12?

Q:KIDINT
Have any of them expressed any interest in recycling or composting?
1 Yes
2 No
8 Not Sure
9 Refused

Q:OWNHOME
Do you currently rent or own your home?

1 Rent
2 Own
8 Not Sure
9 Refused

Q:RESPAGE
What is your age?[99 FOR MISSING]

Q:EDUC
Which of the following best describes your level of education? [READ LIST]

1 NOT A HIGH SCHOOL GRADUATE
2 A HIGH SCHOOL GRADUATE
3 SOME COLLEGE OR TRADE SCHOOL
4 A COLLEGE GRADUATE
5 A GRADUATE/PROFESSIONAL DEGREE
8 NOT SURE
9 MISSING

Q:ZIPCODE
What is your zip code?(USE 99999 FOR REFUSED OR DON'T KNOW)

Q:RESPINCM
Counting income from all sources, including earnings from all jobs, unemployment insurance, pensions, welfare, and so on, and counting income for everyone living in your home, which of the following ranges did your household income fall into last year?

1 LESS THAN $12,500
2 $12,500 - $25,000
3 $25,000 - $35,000
4 $35,000 - $50,000
5 OVER $50,000
8 NOT SURE
9 MISSING

APPENDIX B

The SAS System

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RESTYPE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	865	100.0	865	100.0

RESPSEX	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Male	341	39.4	341	39.4
Female	524	60.6	865	100.0

RESIDENT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
County	465	53.8	465	53.8
City	400	46.2	865	100.0

ALUMCAN	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	280	32.4	280	32.4
Yes	585	67.6	865	100.0

STEELCAN	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	552	63.8	552	63.8
Yes	313	36.2	865	100.0

The SAS System

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PLASTIC	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	414	47.9	414	47.9
Yes	451	52.1	865	100.0

GLASS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	500	57.8	500	57.8
Yes	365	42.2	865	100.0

PAPERS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	320	37.0	320	37.0
Yes	544	63.0	864	100.0

Frequency Missing = 1

CARDBORD	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	595	68.8	595	68.8
Yes	270	31.2	865	100.0

The SAS System

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PAPPROD	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	656	75.8	656	75.8
Yes	209	24.2	865	100.0

OTHITEM	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	768	88.8	768	88.8
Yes	97	11.2	865	100.0

GARBAGE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	377	43.6	377	43.6
2	221	25.5	598	69.1
3	230	26.6	828	95.7
4	7	0.8	835	96.5
5	3	0.3	838	96.9
6	27	3.1	865	100.0

The SAS System

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RECYCLE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	137	15.8	137	15.8
2	223	25.8	360	41.6
3	195	22.5	555	64.2
4	98	11.3	653	75.5
5	157	18.2	810	93.6
6	50	5.8	860	99.4
8	5	0.6	865	100.0

GRASS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	445	51.5	445	51.5
2	62	7.2	507	58.7
3	23	2.7	530	61.3
4	8	0.9	538	62.3
5	166	19.2	704	81.5
6	55	6.4	759	87.8
7	8	0.9	767	88.8
8	41	4.7	808	93.5
9	37	4.3	845	97.8
10	19	2.2	864	100.0

Frequency Missing = 1

The SAS System

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LEAVES	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	244	28.3	244	28.3
2	121	14.0	365	42.3
3	44	5.1	409	47.4
4	21	2.4	430	49.8
5	174	20.2	604	70.0
6	85	9.8	689	79.8
7	23	2.7	712	82.5
8	96	11.1	808	93.6
9	39	4.5	847	98.1
10	16	1.9	863	100.0

Frequency Missing = 2

SHRUB	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	263	30.5	263	30.5
2	65	7.5	328	38.1
3	30	3.5	358	41.5
4	93	10.8	451	52.3
5	136	15.8	587	68.1
6	85	9.9	672	78.0
7	119	13.8	791	91.8
8	52	6.0	843	97.8
9	19	2.2	862	100.0

Frequency Missing = 3

The SAS System

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FOOD	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	82	9.5	82	9.5
2	327	37.8	409	47.3
3	230	26.6	639	73.9
4	208	24.0	847	97.9
5	16	1.8	863	99.8
8	2	0.2	865	100.0

YARDREG	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Oppose	437	50.6	437	50.6
Support	426	49.4	863	100.0

Frequency Missing = 2

YARDSUPP	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not Strong	139	32.6	139	32.6
Strong	287	67.4	426	100.0

Frequency Missing = 439

The SAS System
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YARDOPP	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not Strong	108	51.9	108	51.9
Strong	100	48.1	208	100.0

Frequency Missing = 657

FACILTY	Frequency	Percent	Cumulative Frequency	Cumulative Percent
County, Willing	218	46.9	218	46.9
County, Not willing	247	53.1	465	100.0

Frequency Missing = 400

PAYFEE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
County, No	280	60.2	280	60.2
County, Yes	185	39.8	465	100.0

Frequency Missing = 400

TRANSPRT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
County, No	443	95.3	443	95.3
County, Yes	22	4.7	465	100.0

Frequency Missing = 400

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CITYGARB	Frequency	Percent	Cumulative Frequency	Cumulative Percent
City Pays	259	71.7	259	71.7
People Pay	102	28.3	361	100.0

Frequency Missing = 504

CNTYGARB	Frequency	Percent	Cumulative Frequency	Cumulative Percent
County Pays	198	47.1	198	47.1
People Pay	222	52.9	420	100.0

Frequency Missing = 445

VOLUME	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No increase	167	22.4	167	22.4
Increase	578	77.6	745	100.0

Frequency Missing = 120

ILLEGDMP	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No increase	76	9.8	76	9.8
Increase	701	90.2	777	100.0

Frequency Missing = 88

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PRIVCHRG	Frequency	Percent	Cumulative Frequency	Cumulative Percent
County, Oppose	360	77.4	360	77.4
County, Support	105	22.6	465	100.0

Frequency Missing = 400

CHARGSUP	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not Strong	404	86.9	404	86.9
Strong	61	13.1	465	100.0

Frequency Missing = 400

CHARGOPP	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not Strong	424	91.2	424	91.2
Strong	41	8.8	465	100.0

Frequency Missing = 400

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CNTYDIST	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	142	30.6	142	30.6
2	109	23.5	251	54.1
3	75	16.2	326	70.3
4	53	11.4	379	81.7
8	85	18.3	464	100.0

Frequency Missing = 401

CITYDIST	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	199	49.9	199	49.9
2	87	21.8	286	71.7
3	29	7.3	315	78.9
4	31	7.8	346	86.7
8	53	13.3	399	100.0

Frequency Missing = 466

SUBDIV	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	191	22.1	191	22.1
Yes	673	77.9	864	100.0

Frequency Missing = 1

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RULES	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	546	95.8	546	95.8
Yes	24	4.2	570	100.0

Frequency Missing = 295

UPSET	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	698	85.5	698	85.5
Yes	118	14.5	816	100.0

Frequency Missing = 49

COMPOST	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	493	57.0	493	57.0
Yes	372	43.0	865	100.0

GARDEN	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	273	31.6	273	31.6
Yes	592	68.4	865	100.0

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GARDTYPE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Veg.	51	8.6	51	8.6
Flower	226	38.2	277	46.9
Both	314	53.1	591	100.0

Frequency Missing = 274

COMMORG	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	556	65.0	556	65.0
Yes	300	35.0	856	100.0

Frequency Missing = 9

MEMBER	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	753	87.1	753	87.1
Yes	112	12.9	865	100.0

CONTRIB	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	657	76.0	657	76.0
Yes	208	24.0	865	100.0

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DECOMPOS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	461	59.6	461	59.6
Agree	313	40.4	774	100.0

Frequency Missing = 91

SOCPROB	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	66	8.0	66	8.0
Agree	760	92.0	826	100.0

Frequency Missing = 39

STORAGE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	655	81.4	655	81.4
Agree	150	18.6	805	100.0

Frequency Missing = 60

EFFRECYC	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	730	88.5	730	88.5
Agree	95	11.5	825	100.0

Frequency Missing = 40

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EFFCOMP	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	585	78.4	585	78.4
Agree	161	21.6	746	100.0

Frequency Missing = 119

YARDSPAC	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	624	83.1	624	83.1
Agree	127	16.9	751	100.0

Frequency Missing = 114

LAWS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not familiar	716	83.3	716	83.3
Familiar	144	16.7	860	100.0

Frequency Missing = 5

SCHOOLS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not familiar	683	79.1	683	79.1
Familiar	181	20.9	864	100.0

Frequency Missing = 1

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BAGIT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not familiar	753	87.2	753	87.2
Familiar	111	12.8	864	100.0

Frequency Missing = 1

MASTER	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not familiar	783	90.6	783	90.6
Familiar	81	9.4	864	100.0

Frequency Missing = 1

ONWHEEL	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not familiar	759	87.8	759	87.8
Familiar	105	12.2	864	100.0

Frequency Missing = 1

DROPSWAP	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not familiar	810	93.8	810	93.8
Familiar	54	6.3	864	100.0

Frequency Missing = 1

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BINS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not familiar	634	73.4	634	73.4
Familiar	230	26.6	864	100.0

Frequency Missing = 1

HHNUMBER	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	122	14.3	122	14.3
2	331	38.9	453	53.2
3	191	22.4	644	75.7
4	134	15.7	778	91.4
5	73	8.6	851	100.0

Frequency Missing = 14

KIDINHH	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	577	67.6	577	67.6
1	276	32.4	853	100.0

Frequency Missing = 12

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KIDNUM	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	0.7	2	0.7
1	144	52.2	146	52.9
2	98	35.5	244	88.4
3	22	8.0	266	96.4
4	4	1.4	270	97.8
5	2	0.7	272	98.6
6	1	0.4	273	98.9
7	1	0.4	274	99.3
9	1	0.4	275	99.6
10	1	0.4	276	100.0

Frequency Missing = 589

KIDINT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	695	80.3	695	80.3
Yes	170	19.7	865	100.0

OWNHOME	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	99	11.5	99	11.5
Yes	760	88.5	859	100.0

Frequency Missing = 6

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EDUC	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not college Grad	496	57.9	496	57.9
College Grad	361	42.1	857	100.0

Frequency Missing = 8

RESPINCM	Frequency	Percent	Cumulative Frequency	Cumulative Percent
< 12,500	69	9.8	69	9.8
12,500 - 25,000	101	14.3	170	24.1
25,000 - 35,000	127	18.0	297	42.1
35,000 - 50,000	138	19.5	435	61.6
Over 50,000	271	38.4	706	100.0

Frequency Missing = 159

AGEBYCAT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
18-25	53	6.3	53	6.3
26-35	127	15.1	180	21.4
36-45	197	23.5	377	44.9
46-55	183	21.8	560	66.7
56-65	110	13.1	670	79.8
65+	170	20.2	840	100.0

Frequency Missing = 25

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RECSUM	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	175	20.3	175	20.3
1	106	12.3	281	32.5
2	95	11.0	376	43.5
3	87	10.1	463	53.6
4	74	8.6	537	62.2
5	125	14.5	662	76.6
6	92	10.6	754	87.3
7	78	9.0	832	96.3
8	32	3.7	864	100.0

Frequency Missing = 1

RECTOT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not Serious Recycler	464	53.6	464	53.6
Serious Recycler	401	46.4	865	100.0

_GRASS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	657	79.8	657	79.8
Yes	166	20.2	823	100.0

Frequency Missing = 42

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_LEAVES	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	593	77.3	593	77.3
Yes	174	22.7	767	100.0

Frequency Missing = 98

_SHRUB	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	769	89.2	769	89.2
Yes	93	10.8	862	100.0

Frequency Missing = 3

_FOOD	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	783	90.5	783	90.5
Yes	82	9.5	865	100.0

COMPSUM	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	503	67.6	503	67.6
1	91	12.2	594	79.8
2	69	9.3	663	89.1
3	62	8.3	725	97.4
4	19	2.6	744	100.0

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Frequency Missing = 121

COMPTOT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	624	72.1	624	72.1
Yes	241	27.9	865	100.0

DISTANCE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
5 minutes or less	341	47.0	341	47.0
6-10 minutes	196	27.0	537	74.1
11-15 minutes	104	14.3	641	88.4
Over 15 Minutes	84	11.6	725	100.0

Frequency Missing = 140

KID_INFO	Frequency	Percent
No kids	589	68.1
Have kids, no interest	106	12.3
Have Kids, are interested	170	19.7

KID_INFO	Cumulative Frequency	Cumulative Percent
No kids	589	68.1
Have kids, no interest	695	80.3
Have Kids, are interested	865	100.0

APPENDIX C

CUMULATIVE DISPOSITION REPORT

	1st	2nd	3rd	4th	5th+	Total	Pct
1 No Answer	1587	600	249	123	79	2638	25.7
2 Busy	423	240	145	100	74	982	9.6
3 Answering Machine	820	330	135	74	38	1397	13.6
4 Business/Fax	631	85	20	5	2	743	7.2
5 Call back	733	291	131	48	29	1232	12.0
6 Disconnected	949	57	12	3	5	1026	10.0
7 Over Quota	146	58	27	13	7	25	12.4
8 Refusal	703	245	92	34	18	1092	10.6
9 Completed	550	205	60	30	20	865	8.4
10 Partial Complete	34	12	3	0	0	49	0.5
Incidence (Pct)	45.4	47.0	40.6	46.9	52.6	45.6	
Total Dialings	6576	2123	874	430	272	10275	100.0

VITA

Kevin Lamons was born in Knoxville, Tennessee, on April 29, 1973. He attended Farragut High School and was graduated in June 1991. He entered the University of Tennessee, Knoxville in August 1991 and received his Bachelor of Science degree in Agricultural Economics in December 1995. In January 1998 Kevin reentered the University of Tennessee, Knoxville and completed the requirements for Master of Science in Agricultural Economics in January 1998.