

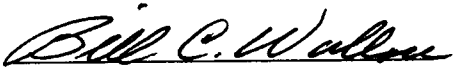
To the Graduate Council:

I am submitting herewith a dissertation written by Charles Richard Yard entitled "A Survey of Knox County, Tennessee Residents on the Use and Disposal of Household Hazardous Waste." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a Major in Human Ecology.

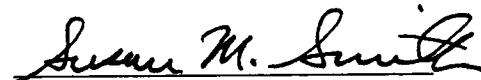


Dr. Robert Kirk, Major Professor

We have read this dissertation
and recommend its acceptance:



Dr. Bill Wallace

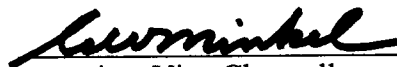


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Dr. Frank Leuthold

Accepted for the Council:



Associate Vice Chancellor and
Dean of the Graduate School

**A SURVEY OF KNOX COUNTY, TENNESSEE RESIDENTS
ON THE USE AND DISPOSAL OF HOUSEHOLD HAZARDOUS WASTE**

**A DISSERTATION
PRESENTED FOR THE
DOCTOR OF PHILOSOPHY
DEGREE
THE UNIVERSITY OF TENNESSEE, KNOXVILLE**

**Charles Richard Yard
December 1999**

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DEDICATION PAGE

This dissertation is dedicated to

my wife

Lora Marie Brummette Yard

and my parents

Alma Allred Yard

and

Lt. Colonel Charles Richard Yard Sr.

My wife for her support, encouragement and patience,

My mother for her support and encouragement,

and my father for providing me with unwavering

determination and motivation.

ACKNOWLEDGEMENTS

Both the culmination of this study and completion of the Doctor of Philosophy degree in Department of Human Ecology have been due to the encouragement and support of numerous people. Each of these people has been instrumental in making the accomplishment of this goal possible by providing specific support and expertise to support the project, contribute to my personal mental development, and contribute to my professional growth.

Specifically, I would like to express thanks to my Dissertation Committee, each of which has provided irreplaceable input into the achievement of this goal. I would like to thank Dr. Robert Kirk, who while acting as my committee chair, taught me how to navigate the waters of the Ph.D. program, and taught me a number of valuable lessons in life above and beyond the academic world. I would like to thank Dr. Bill Wallace, who first instilled in me the belief that my personal goal of being accepted into and successfully completing this program was possible. Without Dr. Wallace's encouragement and support, I would never have embarked on this journey. Dr. Susan Smith has been equally supportive in the process by providing technical support, encouragement, and advice during her entire involvement as a member of my Doctoral Committee. Dr. Frank Leuthold from the Department of Agricultural Economics has contributed greatly as a committee member and friend. While taking his Rural Sociology course, I realized the importance of the change agent concept of technology transfer to the field of Health and Safety Education. I recognized through his lectures and subsequent discussions the extensive knowledge that he possesses in the fields of agriculture and economics. I also recognized that he is one of those rare individuals that could successfully mix extensive professional knowledge with everyday common sense.

I would like to thank Dr. June Gorski for encouraging me to submit my first paper to the Journal of Environmental Health for publication, and Kerri Springer for the statistical guidance during the development of this study.

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As in the dedication of this dissertation, I would like to thank my wife for providing unwavering support and patience throughout the years it took to complete this program. I would also like to thank my mother, who taught school in Knox County for forty-one years and instilled in me the importance of an education at a very early age.

Without my family, friends, and mentors, the attainment of this goal would not have been possible.

ABSTRACT

This primary purpose of this study was to conduct a Household Hazardous Waste needs assessment of a sample of the population of Knox County, Tennessee. This study was designed to provide quantifiable information on the attitudes and opinions of Knox County Tennessee residents on the use and disposal of Household Hazardous Waste.

The study was conducted using telephone survey methodology and a survey form developed by Tyrus Environmental of Tucson, Arizona under a grant from the National Institutes of Health, National Institute of Health Sciences. The study involved four hundred eleven participants, and data were collected on subject matter ranging from purchasing habits to disposal habits. Demographic data were collected and used in the data analysis, in an attempt to identify trends in knowledge, attitudes, and habits.

The secondary purpose of this study was to use these findings as a basis for the development of a public educational information and awareness program.

Given the categories of materials studied, which included automotive products, paint products, pesticides, household cleaners, batteries, and miscellaneous chemicals, the study found that the population of Knox County Tennessee most commonly purchased cleaners and household batteries. When disposal habits were considered, the most commonly improperly disposed of material was in the form of household batteries, 81.1% of the respondents reported that they put household batteries in the garbage for regular pick up. Seventy four percent of the respondents were aware of potential health problems associated with the improper use and disposal of these materials, and 86.3% were aware of pollution problems caused by the improper disposal of these materials. A large percentage of participants (71.4%) were not aware that Knox County Tennessee has a permanent disposal facility for Household Hazardous Waste.

Using the Pearson chi square test and a .05 level of significance, several areas of statistical significance were found. Significant relationships were found between: (1) home ownership and awareness of a permanent Household Hazardous Waste collection center in Knox County; (2) age and awareness of the collection center; and (3) home ownership as compared to willingness to travel to reach a collection center.

The pilot and main studies were conducted over a seven-month period, lasting from January 1999 to July 1999.

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CHAPTER ONE

PURPOSE AND NEED FOR THE STUDY

I. INTRODUCTION

Since the inception of environmental law, the primary focus of effort has been to control industrial emissions, which have often been extensive. These large scale sources of emissions have been the most obvious place to begin efforts at controlling environmental pollution, and these large scale emissions have been the most quickly and seriously damaging to the environment. In the 1990's, and more specifically in the middle to late 1990's, many of these industrial emission sources have been successfully monitored, minimized and controlled. While industrial pollution sources still create a great burden on the environment and still negatively affect the health of many Americans, the focus of the environmental effort has been broadened to include smaller, more subtle sources of pollution. Among these smaller sources receiving increased attention are those which may be purchased by the everyday consumer. These products are often disposed of in the most convenient way possible, which is to say that many are disposed of in a dangerous manner.

In theory, there are two contributing factors that make consumer product use and disposal of hazardous materials particularly troublesome. The first factor is that many consumers may not be aware of the hazards associated with using certain products that they purchase off of the shelf. There is a danger that these consumers may be inclined to underestimate the potential hazards associated with products which may be purchased in a supermarket or at a local department store. The hazards of using these products improperly include environmental releases and negative health effects such as poisonings. The second contributing factor may combine with the first factor to create a cascading event. Factor two may be explained in the following way. Consumers who are unaware of the hazards associated with the use of a product, may be inclined to be unaware of the need to dispose of the product properly. The result is an inherently hazardous product that is both used

and disposed of improperly. The dangers of improperly using and disposing of a hazardous product are numerous.

An improperly disposed of product may lead to environmental exposures, which have been defined as "any passive, non-occupational exposure that results from contamination of air, water, or soil" (Litovitz, 1997) or it may lead directly to an unintentional general poisoning event. The 1996 Annual Report of the American Association of Poison Control Centers Toxic Exposure Surveillance System, reports that unintentional general exposures are attributed to the "vast majority (85.7 percent) of poison exposures." (Litovitz 1997)

It is important to note that the same constituents that make a material or product hazardous to the environment also make that product hazardous to humans and animals. For this reason, this study focused on both potential environmental hazards and health hazards. These issues are so thoroughly interrelated that many in depth surveys on Household Hazardous Waste address both environmental and health concerns as a matter of necessity.

II. STATEMENT OF THE PROBLEM - PURPOSE OF THE STUDY

The primary purpose of this study was to conduct a Household Hazardous Waste needs assessment of a sample of the population of Knox County, Tennessee.

The secondary purpose of this study was to use these findings as a basis for the development of a public educational and informational awareness program.

These purposes led to the following research questions:

1. What categories of hazardous materials are most commonly purchased by the general public in Knox County.

2. How much product do the respondents typically have left over?
3. How do the majority of respondents dispose of products they have left over?
4. To what extent do respondents know of the pollution problems caused by these products?
5. To what extent do the respondents know of the health problems caused by these products?
6. Are respondents aware that there is a permanent collection center for these materials located in Knox County?
7. How far would the respondents be willing to travel in order to properly dispose of these materials?
8. How often do the respondents think they would use a facility designed to properly dispose of these materials?
9. What are the major target groups in Knox County that are in need of specialized education or information about these materials?
10. Is there a need for a public program to educate the residents of Knox County about these issues?

III. NEED FOR THE STUDY

Members of the general public routinely buy potentially household hazardous materials through retail outlets. These products may present hazards ranging from simple skin irritation to fatal systemic poisoning. Estimates of poisoning events in the United States indicate that "more than 90 percent of poisoning events take place in the home. Most poisonings happen to children under the age of five." (American Red Cross, 1993) The American Association of Poison Control Centers Toxic Exposure Surveillance System data is published annually in The American Journal of Emergency Medicine. The latest available data indicates that 91.1 percent of all poisonings occur at a residence. When unintentional poisonings are tabulated, the data indicate that 1,406,911 events were reported in 1996. Of these reported unintentional events, 1,128,027 involved the poisoning of a child under the age of six. (Litovitz, 1996)

The level of knowledge about the hazards presented by household hazardous materials among Knox County residents is not well defined. Some areas of the country have assessed the needs of their communities with alarming results. A study was conducted in Maricopa County, and Pima County, Arizona, in 1996 using the same survey form which was used in this Knox County Tennessee study. The Arizona study revealed that "over 68 percent of the participants had heard the term Household Hazardous Waste (HHW) and believed the products caused health and environmental problems. However 31 and 24 percent of those surveyed did not believe or did not know that HHW could cause health or environmental problems respectively. A statistically significant lower percentage of males than females thought the products caused health problems." (Wolf, 1997) Further, only 24 percent of the females and 15 percent of the males were aware of an existing collection program for these materials. Most importantly, only 13 percent of the females and 8 percent of the males surveyed reported that they actually use the collection programs. (Wolf, 1997)

A major initiative in the Healthy People 2000 Report can be addressed on the community level through two primary programs. The first effort consists of community education programs. Healthy People 2000 asserts that these programs should be designed to "improve environmental health and must be based on primary prevention." The report goes on to state that "The public health system can support the prevention of toxic contamination and human exposure by improving surveillance and monitoring and also by advancing fundamental knowledge of toxic substances." Included in this portion of the report are the following guidelines. (1) "We must conduct the research necessary to reduce the uncertainties inherent in current environmental risk estimates and develop improved risk assessment models." (2) "We must learn to educate the public about environmental risks along with rational and useful suggestions for protecting against environmental risks."

A second related need illustrated by Healthy People 2000 addresses the need for proper avenues of disposal of commonly available hazardous materials for members of the public. Objective 11.15 states that the Healthy People 2000 goal is to "Establish programs for recyclable materials and Household Hazardous Waste in at least 75 percent of counties." It goes on to state that "Special community collection of household toxic waste would help ensure that such wastes are disposed of correctly, thus reducing the risk of air and ground and surface water contamination."

In discussing the Health Belief Model, (HBM) Butler wrote that a person's "likelihood of action" is "determined by the balance or imbalance between the individual's perceived positive and negative forces affecting his or her behavior" (Butler, 1977). A telephone survey using a broad-based range of questions is needed to determine the sample population's perceptions and habits that influence their behavior. By determining the sample populations perceptions and habits, an educational awareness and informational program can be developed.

IV. BASIC ASSUMPTIONS

The study assumed the following:

- 1. The instrument accurately measured the current knowledge in the sample population selected among Knox County residents and produced results that could be duplicated in various situations. The instrument was valid and reliable.**
- 2. The method used to select the sample group resulted in a representative sample of Knox County residents.**
- 3. The respondents answered the questions truthfully.**

V. DELIMITATIONS

The study was delimited to the following.

1. **A sample of those persons eighteen years and older residing in Knox County, Tennessee.**
2. **A data collection period of December 1998 through July, 1999.**

VI. LIMITATIONS

The telephone survey approach has numerous strong points, but does have some basic limitations. These limitations include the inability to show display materials and the intrusive nature of calling residents at their homes.

VII. DEFINITION OF TERMS

For the purposes of this study, the following terms were operationally defined.

1. **Household Hazardous Waste:** Solid and liquid wastes, discarded from homes or similar sources, that are either hazardous wastes or wastes that exhibit any of the following characteristics: ignitability, corrosivity, reactivity, or toxicity.
2. **Needs Assessment:** An activity that involves gathering specific information on a community, including demographic data, and using that information to identify problems in that community and identify the needs of that community.
3. **Awareness Program:** A public health education program designed to provide specific information to a targeted population and increase awareness of specific issues in that population.

VIII. SUMMARY

A need exists to further control sources of pollution, whether these sources are large industrial facilities or members of the general public. In the mid to late 1990's, the focus of the Nation's environmental protection effort has been broadened to include these smaller, but more numerous, sources of pollution (the general public). In the case of the general public, the risk from the improper use and disposal of hazardous materials that is

perhaps of more immediate importance than the environmental consequences is the risk of poisoning. This poisoning risk is greatest among children under the age of 6.

This study was designed to be a needs assessment. The focus of the needs assessment was a sample of the population of Knox County, Tennessee. The study was conducted between December, 1998 and mid July 1999.

In addressing the secondary purpose of this study, (using these findings in the development of a public educational awareness program), the results of the study were utilized in refining and focusing public education efforts to selected target groups in the population. Targeted messages were developed based on the needs identified during this assessment.

The need for the study was illustrated by previous efforts across the United States. The previously conducted survey considered most pertinent to this study was conducted in Arizona using the same survey instrument. The results of that survey illustrated specific needs in specific segments of the population. As was previously the case in Arizona, the need to conduct an assessment designed to quantify the population's specific needs existed in Knox County.

This study operated on several key assumptions, and was limited in two ways, but the instrument used was a valid, reliable, instrument, and the method used to select the sample from the population of Knox County Tennessee was statistically sound.

CHAPTER TWO REVIEW OF RELATED LITERATURE

I. INTRODUCTION

In recent years, the problems associated with HHW have been publicized more than ever before in an effort to prevent poisonings, control environmental pollution, and encourage recycling. Many of these efforts are still in the infancy stage, with the most work to date being focused on needs assessment. Numerous public education efforts have been made, and those efforts, along with suggestions for future programs, were explored in the course of this study. It is important to explore common components of these efforts in an attempt to gather data for the development of future programs.

The University of Tennessee's Waste Management and Research Institute publishes a newsletter, titled InSites. (Christen, 1996) The Winter 1996 issue offers an article titled "No Burgers at this Drive Through." The article discussed a program that was in the proposal stage at the time the issue was released. The Tennessee Department of Environment and Conservation had funded a permanent, year-round collection center for Household Hazardous Waste that would be located in Knox County, Tennessee. According to Christen, the need for the center arises from the fact that "Landfills don't accept paint thinner, antifreeze, motor oil, and a host of other toxic chemicals produced by a household." Christen further states that "Though it is a relatively small portion of the overall waste stream, toxic household waste poses significant risks to the environment and human health."

Before this center was opened, the only alternatives for persons wishing to dispose of HHW were to dump the waste in a sewer, on the land (or in a stream), down the drain, or to take the waste to toxic waste roundups which were occasionally held in the county. The result was essentially a problem needing a solution. Knoxville City and Knox County officials planned to publicize the new center through civic clubs and Realtors. The center would be responsible for disposing of some materials and recycling others. The recycling

could be done by having a hardware type store at the center of the facility where the reusable products could be given to those persons who had a use for them.

While a significant amount of information regarding HHW is available to the general public, literature addressing specific topics is not always readily available to consumers.

This review of the literature is the result of contact with numerous government and private agencies in the United States and Canada. A large number of publications on public education and public opinion surveys were reviewed during this process. This chapter is the result of that review. In conducting research for this project, this review of the literature included information from a variety of sources on a variety of hazardous substances.

This literature review has been divided into the following categories:

1. Literature and studies related in content;
2. Literature and studies related in methodology;
3. Literature and studies related to content and methodology.

The most useful literature and studies were those related in content and methodology.

This literature provided a baseline of previously collected information and offered insight into programs that have been implemented to date.

II. LITERATURE AND STUDIES RELATED IN CONTENT

A. Definitions:

“The U.S. Environmental Protection Agency (EPA) defines *Household Hazardous Waste* in much the same way as it defined *hazardous waste* as stated in the Resource Conservation and Recovery Act (RCRA). A household waste is considered to be hazardous if it is:

- Ignitable
- Corrosive

- Toxic
- Reactive" (Freeman, 1990).

Freeman goes on to point out that "Although EPA has defined household hazardous waste, it is not covered under current EPA disposal regulations."

The delimitations of the study are listed in Chapter One. (Waldo, 1993) explains the OSHA definition of Hazardous Chemical, "Hazardous Chemical means any chemical which is a physical hazard or a health hazard." He further states that "The following are OSHA's exemptions under the HC standard: (i) Any hazardous waste as such term is defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Disposal Act of 1976, as amended by the (42 U.S.C. 6901 et seq.) when subjected to the regulations under that act by the EPA.) Other substances named as exemptions are "(v) Foods, drugs, cosmetics or alcoholic beverages in a retail establishment that are packaged for sale to consumers." Given these exemptions on consumer products, the necessity for assessing the public's understanding of the issues involved and the public's attitudes towards these issues is extremely important in dealing with the problems posed by these materials.

According to the University of Tennessee Agriculture and Extension Service (McManus) other categories of household wastes exist, but they are categorized as "dangerous." These wastes include infectious and radioactive wastes and are not within the scope of this study.

B. Specific health issues:

Health problems associated with HHW may be chronic or acute. Chronic health problems are those that are caused by "delayed health effects" and acute health problems are those causing "immediate health effects" (Waldo, 1993). Many chronic health effects may not be noticed for months or years due to the subtle or gradual

appearance of symptoms. For this reason, the identification of the substance causing the symptoms may be difficult to pinpoint. In acute episodes, the onset of symptoms is quickly noticed and by being more apparent, the source of the problem may be more easily identified.

According to information compiled by Maxine McManus of the University of Tennessee Agricultural Extension Service, common HHW includes; air fresheners which may contain formaldehyde and cause such symptoms as irritation to eyes nose throat and skin. These materials may also be cancer causing agents (carcinogens) and produce such toxic effects as nausea, nose bleeds, dizziness, memory loss and shortness of breath. Other common items stored in an average household may include drain cleaners, herbicides and pesticides, all of which are potentially hazardous when used improperly.

C. Hazard categories:

The categories of hazards chosen for the study focus may be broken down into three subgroups. These hazard groups are:

1. Chemical - These materials include the irritants, carcinogens, corrosives, and toxic materials that pose a threat to health and safety. These materials may cause irritation to the mucous membranes such as eye and nose (irritants), cancer (carcinogens), acid burns (corrosives), and poisoning which "through chemical action usually kills, injures, or impairs an organism" (Webster, 1994).

2. Physical - These materials can cause injury or death by fire and / or explosion. Materials which may fit into this category include petroleum products, aerosols, paint thinners, and furniture polish (McManus).

3. Environmental - Pollution problems may be created by the improper disposal of any of these products. According to a Report to Congress "Waste Oil Study" published by the U.S. EPA in 1974 "the fate of 340 million gallons of waste oil produced each year is unknown," much of this automotive oil is thought to have

been disposed of improperly by back yard mechanics. As for the effect that oil has on drinking water, (a concentration of 1 milligram per liter (1 mg/L) in surface or ground water causes taste and odor problems" (U.S. EPA, 1974). As for the environmental effect this material has on freshwater and marine organisms, the EPA reports that within 96 hours, 50 percent of a population of flat head minnows was killed when exposed to water containing 1.1 percent oil or 11,000 parts per million.

These negative effects of HHW are not exclusive. Many of these materials exhibit qualities that make them hazards in all three categories. A common substance such as gasoline exhibits qualities that make it a chemical hazard, a fire and explosion hazard, and an environmental hazard.

D. Collection issues:

Problems with the collection of hazardous wastes through normal waste collection routes have been recognized for many years. A 1975 publication by the Institute for Solid Wastes of the American Public Works Association pointed out that "Many cities have found hazardous wastes so prevalent that they have prohibited their collection by municipal collection services." The publication goes on to state that "Hazardous Materials include cleaning fluids, crankcase oils, cutting oils, paints, plastics, explosives, acids, caustics, poisons, drugs, radioactive materials and fine powdery earth."

Two major issues impact routine collection of hazardous materials mixed in residential waste. The first issue involves disposal costs, when a collection company picks up hazardous waste, it becomes responsible for disposal costs. Freeman, (1990) cites an EPA report that in 1986, 8400 tons of hazardous waste was discarded into municipal landfills in San Diego County, California. A second issue involves employee safety. Freeman states that "Typically, trash is picked up at the roadside

and loaded onto a truck, where the contents are immediately compacted. This compacting can result in a release of material from a broken container, which can result in unsuspecting refuse collectors becoming the victims of dangerous chemical exposure. Pool acid is a typical waste that has caused serious eye injuries, as well as respiratory damage to refuse collectors.”

The problem with collection of wastes is a concern for residents of Knox County Tennessee. When a “Household Toxics Roundup” was held in 1990, the items collected included:

- 5,100 pounds of pesticides;
- 5,600 pounds of oil based paint;
- 3,200 pounds of waste oil (Douglas, 1990);

From these studies, it is obvious that disposal of household hazardous materials is a problem for the general public.

E. Existing Educational Materials:

1. Description of materials: A substantial amount of educational materials are available to the public. In the course of research on this subject, information was collected from agencies such as: the Alberta Special Waste Management Corporation in Alberta, Canada; the American Lung Association; the American Red Cross; the Tennessee Department of Environment and Conservation; Research Innovations from Seattle Washington; the Canadian Council of Ministers of the Environment; the City of Seattle in Seattle Washington; the Office of Consumer and Corporate Affairs Canada; the Washington Toxics Coalition; the University of Tennessee Energy Environment and Resources Center; the East Tennessee Poison Control Center; Environment Canada in Ottawa Ontario; the National Environmental Health Association in Denver Colorado; Knox County Tennessee; the Knoxville Utilities Board; the Knoxville /

Knox County League of Women Voters; Laidlaw Environmental Services; Martin Marietta Energy Systems; the Maury County, Tennessee Solid Waste Division; the National Safety Council; the University of Tennessee Department of Agriculture; the Nova Scotia Department of the Environment; Robertson County, Tennessee; the Southern Poison Control Center; the U.S. Consumer Product Safety Commission; the Union Carbide Corporation; the U.S. Environmental Protection Agency; the Waste Watch Center; and others.

Many of these documents are in the form of educational brochures, which seem to dominate the information vehicle to the general public. These materials were grouped according to subject matter. A synopsis of the information gathered follows.

2. Poisonous plants: In the poisonous plant category, those plants that simply cause skin rashes were excluded from review. The plants that cause systemic problems were the focus of the literature review. Publications were reviewed from the East Tennessee Poison Control Center, and the Southern Poison Control Center. Publications from both centers, the East Tennessee Poison Control Center (1994) and the Southern Poison Control Center contained a listing of the names of poisonous plants; poisoning prevention tips; and charts complete with diagrams of the plants; a listing of toxic parts of the plants; and symptoms that will be exhibited when a poisoning event occurs. These two publications have sections that focus on child poisoning prevention. The Southern Poison Control Center Guide chart has a listing of toxic and non-toxic plants with a section on do's and don'ts. The East Tennessee Poison Control Center distributes telephone stickers with emergency phone numbers. Charts are used extensively in conveying information to the public on poison plant hazards.

3. Household hazardous chemicals: A large amount of information is produced to educate the public about matters relating to hazardous chemicals in the home. Charts are used extensively in this educational effort. The publication, Household Hazardous Chemicals (McManus) contains a chart with the following categories: a list of products by type; possible hazardous ingredients in those products; and potential hazards associated with those products. These listed products include disinfectants, drain cleaners, furniture polish, and pesticides. The brochure also contains a brief description of symptoms for acute poisoning.

Several publications used statistics to emphasize the importance of the material being presented. Several of these tended to focus on child poisoning statistics, such as the (American Red Cross, 1993) (East Tennessee Poison Control Center, 1994). Poison prevention methods are frequently mentioned in the literature. Methods of prevention are listed in publications produced by the American Red Cross (1993) the office of Consumer and Corporate Affairs Canada the East Tennessee Poison Control Center (1994) St. Mary's Health Center (1996) the U.S. Consumer Product Safety Commission (CPSC) and the Union Carbide Corporation (1965).

A key item listed in many educational brochures is a list of emergency phone numbers. Along with these numbers many brochures contain a list of actions to be taken in an emergency.

Checklists are used as guides to identify potential hazards in a wide variety of applications. Hazard checklists may be used to conduct inspections of kitchens, bathrooms, outdoor areas, and storage areas. Materials from the American Red Cross (1984,1993) Brattesani (1993) the Canadian Council of Ministers of the Environment (CCME) (1992) and the City of Seattle, Cascadia Consulting Group (1996) contain one or more household checklists.

Instructions to read labels thoroughly are common warnings in educational brochures. In addition, it is pointed out that toxic items should be labeled when they are removed from their original containers.

Proper storage of chemicals is a key item in many educational pamphlets. These warnings are included in reference items produced by the American Lung Association (1983) the American Red Cross (1984) the American Public Works Association (1975) Brattesani (1993) CCME (1992, 1997) the City of Seattle Cascadia Consulting (1996) and the City of Seattle Elway Research (1994).

4. Substitutes for household hazardous materials: Alternative products are a significant contribution to managing the HHW problem. Numerous publications are dedicated to the promotion of less hazardous products. The Knoxville/Knox County League of Women Voters has produced a chart listing product uses "for this," and alternatives "try this." A chart illustrating environmental pathways is included in the back of the pamphlet. In the educational pamphlet, Household Chemicals, Alternatives and Precautions, the University of Tennessee Agricultural Extension Service (Macmanus) produced a multi-page chart listing: Products (by function); Precautions, Solutions and Alternatives; and general comments about the products. The most extensive studies addressing substitute materials was conducted by the Washington Toxics Coalition (Dickey, 1990, 1991, 1992, 1995). The resulting three-volume database included grocery store surveys, citizen surveys and an extensive product review and guide for consumers to use in selecting their purchases. As mentioned in a previous section of this review of the literature, the chart format is a very clear and informative way to present information to the public.

5. Labeling and Packaging: While labeling, packaging and storage issues are included in many of the educational materials, some brochures focus more than others on these issues. Several Consumer Product Safety Commission Safety Alerts address these issues. Locked Up Poisons Prevent Tragedy (CPSC, 1993) and Safety Devices Prevent Deaths and Injury (CPSC) address these issues. Packaging and labeling warnings are the focus of brochures on children's art supplies. This problem prompted the Consumer Product Safety Commission to lobby for the creation of a law which became known as LHAMA, the Labeling and Handling of Art Materials Act (CPSC, 1988).

6. Existing hazards in the home: Educational brochures are commonly distributed which address existing hazards in the home. These materials address such hazards as natural gas, carbon monoxide, lead, radon, and indoor air pollution from other sources. These brochures are commonly distributed by organizations such as the Knoxville Utilities Board (1996), the Consumer Product Safety Commission (1990), the Environmental Protection Agency (1990) the American Lung Association (1983).

7. Environmental hazard information: A large percentage of available materials warn of the potential environmental hazards that may be created by the improper use or disposal of common household materials. Many of these materials combine warnings on all three types of hazards. These materials include warnings on environmental, chemical and physical hazards. Among those materials focusing on the environment are publications from the American Lung Association (1983) and the Tennessee Department of Environment and Conservation (TDEC). TDEC produces literature on Household Cleaners (1994), Proper Disposal of Lead Acid Batteries (1994), Proper Disposal of Dry Cell Batteries (1998), Options for Paint and Solvent Disposal (1996), Used Motor Oil (1995), Proper Disposal of Automotive Fluids (1994), and Disposal of Unwanted Pesticides (1996). Tom

Tiesler of TDEC drafted a document titled Regulatory Interpretive Memorandum HW-91-1 Used Oil Filter Recycling and Disposal which specifically addresses regulatory issues concerning disposal of used oil and filters.

A recent Knoxville Utilities Board bill insert discussed Operation Storm Drain (1996). The focus of this educational insert was to encourage citizens to protect water supplies from HHW by warning persons not to dump these materials in storm drains. The insert explains that the storm drains lead to streams, and that the streams can be damaged by poisonous materials such as antifreeze, motor oil and paint. The Environmental Protection Agency has produced Safe Storage and Disposal of Pesticides (1978) which describes acceptable methods of material disposal, container disposal, storage and a list of EPA offices that may be contacted for further information. Environmental programs in Canada have produced such publications as The Household Hazardous Waste Handbook produced by the Alberta Special Waste Management Corporation (1991) that provides the following categories of information: a description of HHW; actions citizens can take now to correct the problems; the risks posed by specific materials; specific risks to children; routes of exposures (with a list of warnings); a list of potential poisons; ways people generate HHW; a chart of warning symbols; a chart of disposal options listing products; related hazards; and recommended disposal methods. More general information is presented in such publications as Household Hazardous Wastes developed by the Canadian Councils of Ministers of the Environment (1992).

Tactics used to snare the public's attention are used in publications such as Laidlaw Environmental's publication What Do You Mean I Have Hazardous Waste in My Home? Solutions to problems associated with these issues are presented in a number of publications. Among these are the Canadian Council of Ministers of the Environment's Recycling of Lubricating Oils, the University of

Tennessee Agriculture Extension Service's Disposing of Household Hazardous Wastes, Environment Canada's The Right Way for Disposal of Household Hazardous Waste, and Household Hazardous Wastes, Put a Lid On It: Disposal of Household Hazardous Waste, Nova Scotia, also published by Environment Canada.

8. Expert Contacts: Two major publications provide state by state lists of experts. These two lists, A Bibliography of Useful References and List of State Experts published by the Environmental Protection Agency (1988) and Household Hazardous Waste-A Manual For One Day Collection Programs (1993), contain information on key contacts in the HHW field.

9. General: Additional materials and suggestions on their use include specific documents, and guidelines on how to best use these materials. As has been demonstrated, at this stage of public education on HHW, a large amount of educational literature has been produced. Guidelines for the effective use of these existing materials are presented by the EPA.

The EPA suggests using the following techniques when presenting a community educational program:

- (1) education through the media;
- (2) information and referral services;
- (3) mailings and mailing inserts;
- (4) posters, handouts, and brochures;
- (5) garbage can labeling;
- (6) street banners;
- (7) displays/exhibits/audiovisual presentations;
- (8) speaker bureau;
- (9) formal education;

- (10) point of purchase information;
- (11) workshops and conferences.”

Materials collected during the research for this literature review are in forms such as pamphlets, magazine articles, mailing inserts, and newsletters.

(a) Pamphlets:

The pamphlets collected were produced by numerous agencies in both the United States and Canada. The pamphlets varied from single sheets of information to small booklets. One example of such a booklet is *The Household Hazardous Waste Handbook*. This handbook was developed and distributed by the Alberta (Canada) Special Waste Management Corporation. This guide defines hazardous waste and recommends immediate actions that can be taken to address HHW issues. In addition, it describes the risks of not taking action; the risks to children; potential poisons; how to dispose of some common household wastes; and among other things; what you can do in your community. (1991). This guide was one of the most complete instructional pamphlets reviewed by the researcher.

(b) Newsletters:

Newsletters were collected from numerous agencies and included several EPA publications. Among these publications were the *Environmental Fact Sheet for Final Streamlined Regulations for Collecting and Managing Universal Wastes*, *EPA Pollution Prevention News*, and the *EPA's Reusable News*. Newsletters from other agencies included *Household Hazardous Waste Management News* (1996); *Hazardous Substances and Public Health* (1996, 1997), and the *OSHA Compliance Advisor* (1997). The *Household Hazardous Waste Management News* published an article titled “Changing Behavior” in its May 1996 issue. The article points out that while governments often distribute brochures to educate the public, this method usually doesn't change their behavior. Research

shows that simply providing information has a limited effect on behavior change.” This publication recommends an approach used in King County, Washington that instructs the promoter to define the problem; identify barriers to reaching your audience; and use behavior change principles. The article illustrates what it suggests are key principles in changing behavior. “(1) Getting involved is the first step to making a commitment, and making a commitment makes people more likely to act; (2) Feedback and follow-up are important; (3) People will listen first to their friends or relatives, or others they see as credible; (4) Change agents and role models are important; (5) Present information effectively.

(c) Mailing inserts:

Mailing inserts were obtained from the Knoxville Utilities Board (KUB). An example of this type of mailing can be found in the second quarter, 1996 *KUB Connection*. This particular mailing describes a joint Ijams Nature Center / KUB venture known as “Operation Storm Drain.” This project encouraged persons to paint storm drains with the warning “Dump No Waste-Drains to Stream.” The brochure goes on to state that “Highly toxic chemicals, like antifreeze, motor oil, and paint poison the water; plastic chokes the waterways and kills fish; and yard waste clogs drains and corrupts the balance of nutrients in the water.” This type of mailing has the advantage of reaching virtually all utility residents in a city and county. KUB mailings reach approximately 220,000 households.

F. Drop-off recycling centers:

The Healthy People 2000 Report (1990) listed the need for proper avenues of disposal of commonly available hazardous materials for members of the public. Objective Number 11.15 states that the Healthy People 2000 goal is to “establish programs for recyclable materials and Household Hazardous Wastes in at least 75

percent of counties. Earlier in this critique, Christen was quoted while discussing a proposed Knoxville, Knox County, and State of Tennessee, HHW collection center.

The proposed center opened in April of 1997 and was named the Knoxville-Knox County HHW collection center. The center is centrally located in the City of Knoxville and operates as a household hazardous waste collection and exchange center only. Businesses are expected to deal with their own hazardous waste.

According to information circulated by the center, its goals are to: “(1) provide a safe environment to dispose of toxic, poisonous, corrosive, reactive, flammable, combustible materials; (2) insure safer and cleaner landfills; (3) provide a high level of convenience for Knoxville and Knox County residents; (4) maximize diversion of HHW to recycling and reuse options; (5) provide public education aimed at helping people understand the hazards associated with HHW; (6) reduce the community’s liability for the cleanup of contamination resulting from improper HHW disposal.” (1997)

The EPA newsletter *Reusable News* Spring 1992 issue, reported that “the number of permanent HHW collection programs has increased by more than 70 percent from 1990 to 1991.” This reflects a growing recognition of the environmental and health problems posed by HHW, and is consistent with the Healthy People 2000 goal.

In 1993, the EPA published a document titled *Household Hazardous Waste Management, A Manual for One Day Collection Programs*. This document provides guidelines for selecting “wastes and collection methods . . . waste management methods . . . minimizing liability . . . funding . . . contracting . . . training . . . education . . . and a guide on how to research laws and regulations.”

The document provides a complete, step by step guide to developing and publicizing a HHW collection and recycling center.

III. LITERATURE AND STUDIES RELATED IN METHODOLOGY

Applicable studies on hazardous materials are not restricted to household materials. A self paced learning module developed by Karl Ford and produced by the National Environmental Health Association, gives basic guidelines for survey population selection techniques used to contact industries. In surveying industry, the author recommends the following steps: "A mailing list of potential hazardous materials users is prepared, a questionnaire is developed and mailed and the results are tabulated and analyzed." In selecting industries for survey, the author suggests using national directories such as Dun and Bradstreet, Moody's, Standard and Poor's, the Thomas Register, and MACRAE'S." Using these sources, a mailing list is developed. The next step, according to Ford, is to "formulate a questionnaire for the targeted mailing list." Further, Ford recommends "A cover letter signed by a responsible official should:

1. Emphasize the purpose of the survey;
2. Emphasize the good neighbor policy;
3. Cite appropriate legal authority to protect public health and abate nuisances;
4. Assure that proprietary information is not compromised;
5. The package should contain a self addressed stamped envelope."

Final steps in the process would be to follow up the correspondence with a deadline for return, and telephone calls.

Much of this method would be useful in the development of a mail out survey. It is recognized, however, that surveying home owners would vary considerably from surveying industries. Ford recommends contacting local fire departments, wastewater treatment districts, and other government agencies for additional information.

In selecting the population for survey, measures must be taken to reduce bias in that population. The selection of a sample population may best be guided using a population representative of the population you want to measure. This sample population may be selected by using a random numbers method. (Young, 1981)

The text Health Education and Health Behavior, Theory, Research and Practice provided a broad based background into Health Research and Theory (Glanz, 1990). This text provided an extensive background into how health beliefs, behavior and societal interactions influence the health of populations. In depth descriptions into the variety of survey designs available, the types of variables commonly used in survey research, and interactions between factors which may affect a research project were illustrated in Research Methods in Health Education (Ellison, 1995). The text by Robinson titled Research Techniques for the Health Sciences (1987) provided valuable input into the methods used to conduct a variety of different types of research.

A serious HHW program designed to reach the public with an effective educational program must include a coordinated, concerted interagency effort to promote information on poisoning and environmental hazards associated with these materials. It should be structured around a model which is focused on behavior change such as the Health Belief Model. Butler, 1997 "postulates that:

- 1) Health behavior of all kinds is related to a general health belief that one is susceptible to health problems.
- 2) Health problems have undesirable consequences.
- 3) Health problems and their consequences are usually preventable.
- 4) If health problems are to be overcome, barriers must be overcome."

Butler points out that "The HBM consists of three distinct phases that lead to an action related to health: individual perception, modifying factors, and likelihood of action."

By using a model such as the HBM and incorporating the suggestions provided by the EPA, the local Knoxville-Knox County government could continue to develop a comprehensive program which should include community education supplemented by chemical, safety, and environmental education in the school system. In addition, the local program could make use of a checklist, such as that published in the document Changing Behaviors, Insights and Applications (1996). This checklist contains the steps:

- 1) Define your objective.
- 2) Select your audience.
- 3) Learn about your audience.
- 4) Find out about your audience's barriers to making the change.
- 5) Develop strategies.
- 6) Develop a measure to determine the effectiveness of your strategies.

An ongoing program to assess buying habits, such as the King County Grocery Store Survey may be used to provide ongoing evaluation of the program's progress. This program could be combined with a community based point of purchase educational program to supplement the other techniques.

The major (and most expensive) barrier to program success in Knox County has been removed. An alternative disposal site for HHW has been established and is available in Knox County for household use. Much of the literature is currently available and model programs exist in progressive cities around the nation.

A creative, low cost, and effective program could be implemented with currently available needs assessment techniques, an effective community health based approach, currently available information, and assets.

IV. LITERATURE AND STUDIES RELATED IN CONTENT AND METHODOLOGY

Numerous studies involving public opinion on recycling have been conducted in recent years. One 1990 study in Knox County, Tennessee gathered information on attitudes expressed by participants in the Knox County Toxics Roundup. Some key attitudes were expressed by the response given in questions such as:

- “What primarily motivated you to participate in the Household Toxics Roundup?”
70 percent responded "to avoid water and air pollution;"
20 percent responded "to avoid Accidents in the Home;"
- “Would you pay \$10 to have this service continue?”
80 percent responded "yes;"
20 percent responded "no" (Knox County, 1990).

Activities surrounding Earth Day, 1990 sparked an interest in public opinion polling on environmental issues. Research from Cambridge Research / Reports International found that public concern about environmental issues accelerated sharply in the late 1980's and has stabilized at high levels or continued to grow (Council of Logistics Management, 1983). The Reuse and Recycling text further reports that “when asked to rank environmental issues, people place solid waste disposal below air pollution and water pollution, but above such issues as hazardous waste and global warming. Views on the severity of the solid waste disposal problem were almost evenly divided: 48 percent view it as very to somewhat serious, and 45 percent regard it as not too serious or not serious at all.”

A. Focus Groups:

Focus group reports have been a major source of information on attitudes towards HHW. Karen Brattesani, Ph.D. conducted a focus group study on HHW for the dual purpose of exploring the (1) “the general level of public awareness and understanding about Household Hazardous Materials, what hazard related criteria

people use when purchasing these products, and the relative importance of health related criteria and environment related criteria" (2) the "attitudes and behaviors concerning two specific product groups: household cleaners and pesticides."

(Brattesani, 1993) These items were considered the objectives of the study. She describes the focus group technique as a "qualitative research method that allows in-depth exploration of individual's attitudes and opinions." She acknowledges, however, that due to the small number of participants, "focus groups are not intended to provide the same statistically valid findings as a qualitative study such as a telephone survey." She chose persons with moderate views for the focus group as opposed to those with extremist views on either end of the scale. The moderator's outline suggested specific time periods for each subject area. The allotted amount of time for each discussion area ranged from 10 minutes to 20-25 minutes. Some educational recommendations pertinent to this HHW study were:

- "Find a way to emphasize the safer alternative products so that consumers know what they can use, not just what they feel they can't use.
- Promote only those safe alternatives that work well. Promoting safe alternatives that don't work well, especially in the early stages of an educational program, may lessen the credibility of future educational materials and lessen the likelihood that people will want to try other safe alternatives.
- Encourage people to look before they buy, to read labels thoroughly. Provide examples of the kind of warnings to look for.
- Strengthen the connection between the health and environmental hazards where they exist and are most clear, so that the long term health hazards of environmental pollution are more readily recognized.
- Avoid using chemical names. People perceive them as long complex and generally confusing.
- Go beyond making 'rules' for buying and disposing of hazardous products. Explain what the hazards are in simple but complete ways so that consumers can judge the extent of the hazard and can explain it to others.

- Encourage less use of pesticides using strategies similar to those that encourage less use of hazardous cleaning products.”

In taking a closer look at focus groups, the following case studies are presented. In 1993, a Seattle Washington group known as Research Innovations conducted the Metro Household Hazardous Products Focus Groups Report. The Group selected 2 focus groups consisting of 8 (group 1) and 10 (group 2) persons who were selected during a telephone survey of 1600 persons. The report attempted to measure the general level of public awareness and understanding about HHW. A secondary focus of the group effort was to explore attitudes and behaviors concerning household cleaners and pesticides. Participants were broken down into three groups and each group was assigned a color to code their views. The persons with moderate views were coded yellow. These moderate respondents were chosen for the focus groups. The report lists overview, objectives, methods and findings. (Brattesani, 1991)

In 1994, the Seattle Solid Waste Utility district sponsored a second Household Hazardous Waste Focus Group effort. (Elway Research, 1995) This report was a more in depth effort than the 1993 focus group project. Four groups were chosen for this study, two groups identified as minority residents were chosen along with two groups of self reported voters. There were two main purposes in conducting the focus group study. The first purpose was to “explore the use and disposal of household hazardous chemicals among groups underrepresented in the (original) survey, namely minorities and groups for whom English was a second language.” The second purpose was to test reactions to measures local governments could propose to reduce the impact of hazardous household chemicals.” (Elway Research, 1995) The issues discussed were (1) use of Household Hazardous Waste Products; (2) health concerns and how they affect usage; (3) safer alternative products; (4) information needs; (5) HHW disposal; (6) their views on what the local government

could do to encourage people to cut down on their use of household chemicals; and (7) they were asked to evaluate government involvement proposals. Demographic data collected was used in the categorization of responses.

B. Surveys:

A residential opinion poll conducted in the City of Kirkland, Washington followed a year-long education effort in that city (Patmont, 1990). The study was used to evaluate the educational program titled Hazard Free Community. The evaluation techniques used were: documentation; waste stream measures; and surveys. Of these techniques, the survey method is the most pertinent to this dissertation. The program began with a baseline survey of HHW issues. After the educational program, a second survey was conducted. This technique yielded before and after data for evaluating the effectiveness of the program. The survey instrument was designed to measure awareness of HHW issues. The instrument was pre-tested on twenty randomly selected residents and was modified based on the results of that pretest. Questions selected from this instrument were submitted to the panel of experts during the weighting phase of instrument development for this study. The telephone survey used in the Patmont study consisted of three hundred twenty four interviews. Univariate and Bivariate analyses were used to evaluate the data. HHW Prevalence and disposal practices were studied on four major categories of products. The product categories chosen for analysis were; (1) paint thinner, (2) motor oil, (3) herbicides/pesticides, and (4) toxic cleaning products. The results of this study showed that given these four categories of products:

- “motor oil was the most frequently disposed of HHW;
- toxic cleaning products were reported as improperly disposed of by approximately seventy percent of the respondents;
- younger households (head of the household under 45) reported generating more motor oil waste, while homeowners were more likely to generate paint or herbicide/pesticide waste than non-homeowners;

- Although the groups noted above generated more HHW for certain items, it was not possible to identify any one group (based on age, sex, income, education or home ownership) that appeared to use improper disposal practices” (Patmont, 1990).

Due to these reasons and others cited in the document the author states that “educational programs need not be directed to specific groups but should be effective when applied to the general public at large.”

In 1990, Christine M. Patmont published the King County Residential Opinion Survey of Household Hazardous Waste Issues: Baseline, 1990 (Patmont and MAR-KEY Research, 1990).

This study involved 326 randomly selected King County households. An additional 100 persons were selected from a suburb of Seattle known as the Rainier District. This district is characterized by its low socioeconomic Status (SES) and was selected because it exhibited low participation in the City of Seattle’s curbside recycling service. Questions for both groups were included which discussed “demographics, hazardous waste generation and disposal, knowledge and use of hazardous waste collection facilities, and on alternative products and practices which lessen hazardous waste amounts.” Ninety five percent of the respondents agreed to participate in the study.

The surveys were conducted by telephone interviewers under supervision. Residents were chosen at random from telephone directories from towns and cities in King County. The results were stated to be accurate to within +/-6 percent with a 95 percent confidence interval.

The low SES study involving 100 participants exhibited an accuracy of +/- 10 percent and a confidence interval of 95 percent.

Calls were made during the day as well as in the evening. This method was used "in order to allow potential respondents an opportunity to be contacted regardless of their schedule."

Reliability of the instrument was established during the City of Kirkland survey. Portions of the King County Opinion Survey instrument were used in the development of the final instrument used for this dissertation.

One of several follow up surveys on HHW was conducted in King County, Washington in 1992. This survey involved 1,600 telephone interviews (King County Solid Waste Division, Decision Data, 1997). The objective of this study was similar to the 1990 Patmont study but the questionnaire was significantly altered. "The major purpose of this study was to provide baseline information on behavior and attitudes related to four waste streams: latex and oil based paint, motor oil, pesticides and weed killers, and household cleaners." In addition, this study measured "Demographics and general attitudes and behaviors concerning environmental issues as a means of helping to identify target audiences and educational strategies for the four waste streams." Geographic region, ethnic background and income were also investigated." One key category in this study was a section on sources of information. In order to identify the most common sources of information on HHW, the study designers explored the current sources of information available to the public. Of these sources, the top three were "store employees, product labels, and books, (14 percent, 13 percent, and 11 percent respectively). The top governmental agency responsible for educating the public was the local health department, on which only four percent of the respondents relied for information. The study further stated that "Only 15 percent of the

respondents were very satisfied with current sources of information.” In an attempt to identify “attitudinal / behavioral clusters” the study used a Likert type attitude scale and a yes-no behavioral question format. This section of the survey consisted of seven questions in each category. Three clusters resulted from the statistical analysis of this data, one positive cluster (positive attitudes toward HHW environmental safety and health), one negative group, and a large intermediate group. These groups were classified as “Green” (positive attitudes), “Yellow” (intermediate attitudes), and “Brown” for negative attitudes. Behaviors by cluster indicated that the “individuals classified as ‘green’ tend to be better educated (61 percent college graduates compared to 42 percent in the yellow cluster, and 36 percent in the brown cluster).” The “green” individuals also tended to be wealthier and composed more strongly of the baby boomer generation (age 31-45). The strongest association found was with education.

Decision Data Inc. conducted a 1994 survey of King County, Washington residents on HHW. This survey (similar to the 1992 study) consisted of 1661 residents. Four categories of waste were used in the study. Some statistically significant changes were found in behavior change in this study. One “positive behavioral change” was “the proportion of respondents who reported that they quit using pesticides in the past year increased by 75 percent (from 2.5 percent in 1992 to 4.5 percent in 1994).” A second positive change “was a 15 percent decrease in the percentage of respondents putting toxic household cleaning products in the garbage compared to 1992. This is attributable to the reduction in the number of respondents disposing of cleaning products (from 12 percent in 1992 to 8 percent in 1994) because the proportion who disposed of these products, actually increased from 51 percent to 65 percent” (King County Solid Waste Division, Decision Data, 1994).

This 1994 survey used the CATI (Computer Assisted Telephone Interviewing) system. This system “displays the questions, accepts and verifies the input, and

determines skip patterns.” The telephone interviews were conducted over a 35 day period, with the calls being “conducted on all days of the week from 9 am to 9 pm. Random samples were collected from three regions around the King County area using the latest telephone books obtained from two companies. “The last four digits of each number was replaced by a random number determined by a pseudo random number generator.” By using this method, the listed-unlisted status of a phone number was not a factor.

The statistical analysis of the results used a “95 percent confidence interval for a proportion of 50 percent +/- 4.5 percent. Hypothesis testing was placed upon a 95 percent confidence criterion. If the test resulted in a probability of no more than 5 percent, the result is referred to as not significant. If the test probability resulted in a probability between 1 percent and 5 percent the result is referred to as weakly or marginally significant or the probability is shown. Test probabilities less than one percent were significant.”

Information awareness questions resulted in 84 percent of the respondents indicating that they had “heard, read, or seen” information about how to handle hazardous products in the last year. The most common sources of information reported were #1 information in the mail (17 percent) non-specific brochure/flyer (16 percent) and non-specific newspaper information (14 percent). When asked where they would seek information on specific products, the most frequent sources of information from “someone at the store (21 percent) the library (13 percent) and the yellow pages (13 percent). Twelve percent of the respondents said they would look in a reference book or brochure.

Portions of the questionnaire used in this 1994 survey were used in the development of the survey instrument for this study.

In the Seattle Solid Waste Utility District Local Hazardous Waste Program King County Household Hazardous Waste Survey (Elway Research 1994). The research investigated the following areas:

- “Use of household hazardous products in the home;
- Recent changes in use;
- Household hazardous waste disposal habits;
- Where people get information about household hazardous products;
- Support for increased government effort in reducing the effects of household hazardous waste.”

Demographic information was collected about the participants, including “age, educational attainment, ethnic background, household income, household makeup, and gender.” The sample size in this study was 400. This population consisted of 239 persons from the City of Seattle and 161 persons from outside of the City in King County. These persons were over 18 years of age and had purchased household hazardous products. The surveys were conducted using a non specified telephone technique.

The statistical technique used to analyze the data collected for the Elway study used a 95 percent confidence interval with a +/- 6.3 percent margin of error for the Seattle portion of the study, and a 95 percent confidence interval with a +/- 7.7 percent margin of error for those participants outside of the city. Calls were made by “trained, professional interviewers under supervision.” All calls were made in the evening hours and a percentage of each interviewer’s calls were recalled for verification.

The results indicated that:

- “Seventy two percent of the respondents indicated that they had received information on household hazardous products through reading a paper or magazine;

- sixty four percent through an insert in their utility bill;
- fifty seven percent from a special utility newsletter mailed to them; and
- forty two percent from television and 36 percent by picking up a brochure.”

Among the “recommendations for future studies,” the Elway report suggests “further research to understand better the types of information people respond to when deciding whether to switch to less toxic products as well as the most effective ways of getting this information to them.”

The City of Seattle operates two HHW collection centers. This study was designed to determine what types of materials are being brought into the centers and to determine who is bringing these materials into the centers.

The following methodology was used. During a 12 month period in 1994-1995, samples were collected from vehicles entering each facility and sorted. The number of samples collected was “based on the proportion of household hazardous waste delivered during the previous year.” The substances were divided into 30 categories for analysis.

A questionnaire was designed to focus on demographic characteristics. This analysis of demographic characteristics was designed to help understanding of the population’s disposal habits. The questionnaire consisted of 19 questions, three of these questions were “open-ended.” The responses were tracked by using a four digit “respondent number. The questionnaire was divided into five subject groups:

- “demographic characteristics;
- visit information;
- familiarity with hazardous waste sites;
- disposal reasons and length of time they stored the materials;
- future plans for using household hazardous waste products.”

A database was created to analyze the information gathered using Boreland Paradox 5.0 for Windows. This database used respondent numbers as case numbers and contained 26 different table. The sampling field form for substances collected contained 720 fields, so the data collected was divided into weight data and container data. The questionnaire contained 47 fields and also used the response number as the key and as a link to other databases.

The City of Seattle conducted an additional study in 1996. This study, titled Household Hazardous Waste: Composition and User Profile Study, was the result of the combined efforts of five research agencies: the Cascadia Consulting Group; Sky Valley Associates; Herrera Environmental Consultants; Elway Research; and the Hopkins Environmental Consulting Group (City of Seattle, 1996). According to the authors, the “findings emphasize the public’s desire for more information, particularly about non-chemical alternatives. Information about health hazards seemed less important, except when it came to children. The research shows support for local governments doing more to promote reduced use of household chemicals and mitigate their effects, but less support for measures restricting access. The research verified the need for targeted outreach to nonwhite residents and speakers of language other than English (City of Seattle Solid Waste Utility, 1996).”

Survey methodology takes numerous forms. One common survey method is to ask questions from persons who turn in waste at toxic waste roundups, such as those previously held in Knox County. The methodology is simple. As vehicles arrive at the center, a surveyor asks several quick questions, allowing the vehicle to pass after answering. These surveys are always voluntary. The standard questions asked during such surveys include:

- (1) the participant’s city and county of residence;
- (2) number of persons in the household;

- (3) the number of households contributing to the waste brought in during the current trip to the center;
- (4) how the participant learned about the center;
- (5) if the participant was aware of HHW before this event;
- (6) how many miles the participant traveled to the event;
- (7) why did the person participate, [options given were: (a) to avoid water and soil pollution; (b) to avoid accidents in the home; (c) garbage service will not accept HHW or (d) it is the right thing to do;]
- (8) what types of materials were brought in;
- (9) would the participant support future HHW collection events;
- (10) how often does the participant believe that these events should be held;
- (11) how would you want the events funded (taxes, user fees, other); and
- (12) how much would you be willing to pay in taxes to fund such an event.

These surveys were designed to be brief in order to keep the traffic moving at the collection center. Other surveys, however, are more in depth. An example of such an in depth survey is a telephone survey.

Telephone surveys are commonly used to collect more specific information than collection site surveys. It is possible to spend significantly more time on a telephone survey (3 to 5 minutes) instead of the approximately 45 seconds commonly spent interviewing the collection site participant. This extra time makes it possible to ask questions such as those developed by Tyris Environmental L.C., under a grant by the National Institutes of Health, National Institute of Environmental Health Sciences. The Tyris survey was the most complete (in terms of acquiring pertinent information) telephone survey located during this research, the format was as follows: Standard telephone interview introduction . . . 18 year age minimum;

- (1) I am going to read a list of household products. Can you tell me which ones you have bought in the past year?

- (2) I see that you have bought some of the products we're concerned about today. What I'd like to ask you is: what do you do with the spent, used, or waste product, product you no longer need (Focus on automotive products if the answer to that question is yes).
- (3) question concerning quantity of material disposed of.
- (4) Do you think the products cause pollution?
- (5) Do you think that they cause health problems?
- (6) Had you heard the phrase "Household Hazardous Waste" before this interview?
- (7) Is there a Household Hazardous Waste collection center in your community?
- (8) Do you use the collection center?
- (9) Question concerning disposal options;
- (10) How many times a year would you use a collection day?
- (11) How far would you drive to use a permanent collection site?
- (12) How many times a year do you think you would use it?
- (13) How do you think a safe disposal option should be funded?
- (14) Question 14 begins a list of demographic questions. These questions include: home or apartment; rent or own home; public sewer or private sewer; zip code; age on last birthday (range); highest grade in school completed (range); family income (range); number of people in household; children under the age of six; race; and sex.

This telephone survey covers all of the key issues of importance to research on HHW. The information gathered from this survey will produce data including: the type of products purchased; the disposal habits of the person being interviewed; their knowledge and attitudes about health effects and environmental pollution; their attitudes towards special collection facilities; and demographic data. This information could be used to select areas of concern for further focus and the target population for an intervention effort.

A study published in the *Journal of Environmental Health* titled "Household Hazardous Waste and Automotive Products, A Pennsylvania Survey." The principal author, Charles Shorten, was contacted in an attempt to gather more information on the project. He replied to the request by sending a copy of the survey. In addition, he indicated that the survey was conducted locally, not nationally, and that there were no attempts to establish reliability or validity. The article itself was well written and included numerous graphs depicting responses. The article also cited numerous other studies conducted in search of similar data. (Shorten, 1995)

The most extensive non-telephone survey instrument located during this research was taken from "Master Home Environmentalist Program (MHEP)." (1994) This program developed the Home Environmental Assessment List (HEAL) and requires a physical walk through of the home by a person who has been trained to look for hazards. HEAL uses the following format:

MHEP section one:

- A. Personal information* (optional); information on residents living in the home (ages, sex, pets, allergies, health complaints); reason for conducting the survey (belief of a problem in home, specific health problem, general concern, curiosity);
- B. The building itself* (age, type construction, remodeling activities, daytime temperature);
- C. Nearby environment* (proximity to airports, railway, and bus station). Proximity to; nearby highway, houses with wood stoves or fireplaces, neighbors using pesticides;
- D. Dust and Lead Control* (peeling paint, carpet, track-in, cleaning, bed room, Furnace);
- E. Moisture problems* (kitchen, bathroom, basement, ventilation, water damage);
- F. Indoor air* (formaldehyde, asbestos, radon, garage and car, indoor heat and stove);

G. Hazardous household products (too numerous to mention);

H. Arts, crafts and hobbies (car maintenance, furniture refinishing, wood working, others).

MHEP Section II:

Section two of the Master Home Environmentalist Program recommends specific actions to be taken to alleviate problems after they are identified. The A through H format lists corrective actions which correspond to the questions which were answered in Section I. This format allows the instrument to serve as a survey form, a diagnostic device, and an intervention device to designed to educate the homeowner.

C. Sales evaluations:

The Washington Toxics Coalition (Dickey, 1995) conducted An Analysis of Household Cleaners and Pesticide Sales in Seattle/Tacoma Grocery Stores.

According to Dickey, there are three ways to measure consumers' use of household products: to count what they buy, to ask them what they buy, and to count what they throw away." He points out that "consumer surveys suffer from the fact that people don't necessarily do what they say they do or will do." He writes that "tracking consumer purchases is the most direct and accurate way to answer these questions."

This approach to needs assessment is very useful. It allows a region to measure the ratio of hazardous materials purchases to "green" purchases over time. In this way a trend in either direction can be detected. When these trends are detected, a customer survey can be conducted to determine whether the trend is related to a specific educational program or is simply incidental.

Overall efforts to promote a community education program could be improved by following the EPA guidelines presented in Household Hazardous Waste Management, A Guide to One Day Collection Programs (US EPA, 1993)."

These guidelines include the following suggestions:

- "Target the audience. Residents are the most important target of a HHW education program. Information about HHW also could reach public officials, civic groups, solid waste personnel, and the business community to encourage financial support, donations of in kind services, or other assistance. The media is an especially important vehicle; media understanding of HHW issues helps ensure accurate and responsible reporting. Educators need resources to develop and communicate a strong understanding of the issue to the people they teach. Manufacturers, retail stores, school chemistry departments, and farmers also can benefit from education about HHW."
- The second set of guidelines presented in the EPA document are included in the section titled "Determine the message and select educational methods." The document points out that "Public Education is a good idea even if a HHW collection event is not yet planned. The scope of this effort will depend on the funds and personnel available.

The public education focus recommended by EPA includes:

- (1) those products that contain HHW;
- (2) how household generation of hazardous waste can contribute to pollution;
- (3) why source reduction is a major goal of a HHW management program;
- (4) what products contain fewer or no hazardous constituents;
- (5) how to shop "smart" (e.g. buying only what is needed);
- (6) how to reduce the amount of HHW generated (e.g. using up household products or giving away what cannot be used);
- (7) how to use products in a way that minimizes harm to the environment;

(8) how to properly store and handle products containing hazardous constituents in the home.”

The EPA document section titled “Public Education Methods and Techniques” suggests the following methods for getting the message across. The EPA makes the following suggestions:

- (1) education through the media;
- (2) information and referral services;
- (3) mailing and mailing inserts;
- (4) posters, handouts and brochures;
- (5) garbage can labeling;
- (6) street banners;
- (7) displays/exhibits/audiovisual presentations;
- (8) speaker bureau;
- (9) formal education;
- (10) point of purchase information;
- (11) workshops and conferences.

IV. Summary:

Using this literature as a basis for this needs assessment project will help substantially in planning an intervention program. By using these guidelines, which have been established and tested in other programs, and by using the results from the survey and data analysis, it was possible to more accurately select the target groups within the population that need intervention programs.

Programs can be improved by using a systematic coordinated effort. As was pointed out by the Waste Watch Center’s Household Hazardous Waste Management News (1996) referenced previously in this critique, while “governments often distribute brochures to

educate the public, this method usually doesn't change their behavior. Research shows that simply providing information has a limited effect on behavior change."

By focusing on brochures as a means of promotion for recycling programs, a community effort may neglect other avenues of health promotion in the community. There can be increased emphasis on education through the media such as articles, public service announcements, talk radio broadcasts, and television educational promotions. Knox County, for example, has used brochures, newspaper announcements and a local telephone information hotline to promote the local HHW collection center.

After reviewing the available literature, it was decided that the Tyrus Environmental survey instrument (developed under the grant from the National Institutes of Health) would be used. This instrument captured all of the data deemed relevant to the study by the researcher. In addition to meeting the content needs of the researcher, the instrument had demonstrated reliability and established validity through the input of a panel of experts during the instrument's development phase.

In keeping with the methodology used for the selected survey instrument, and in keeping with the assets available for a study of this size, it was decided that the instrument would be administered by telephone. As pointed out in the literature, the telephone survey method has numerous advantages, among the most important of these advantages is the assurance that a randomly selected, representative sample of respondents can be obtained using a technique such as the established-prefix, random last four digit number dialing method.

In addition, by using the instrument and methodology already demonstrated, the results of this study will add to the already established database of information obtained during the Arizona studies. This information can be used as a comparison between two very different (both culturally and environmentally) parts of the United States.

Other methodology discussed (such as public education promotional activities using the data collected in this survey) may be applicable in subsequent follow up activities as an actual educational program is developed.

CHAPTER THREE METHODOLOGY

I. INTRODUCTION

The primary purpose of this chapter is to describe the methods that were used in collecting and analyzing the data from the Knox County Tennessee sample population.

In order to quantify the current level of knowledge in the Knox County Tennessee population, the study designer utilized an existing validated survey form to conduct the needs assessment. This form was developed by Tyris Environmental of Tucson Arizona under a grant from the National Institutes of Health, National Institute of Environmental Health Sciences. This form was the instrument previously used in the Arizona study.

The data gathered in the course of this study were analyzed by various statistical methods, that are described later in the chapter. The information gathered during this study was instrumental in the development of a public education program that is focused on the needs of specific target groups. Using the data gained in this study, it was possible to focus on specific target groups, and the specific areas of concern in these target groups. By using a systematic needs based approach to the problem, the available resources expended to address the problem were used to their greatest potential.

II. STUDY POPULATION AND SAMPLE

The sample chosen for this study was selected from Knox County Tennessee. The City of Knoxville population was 165,000 persons at the time of the 1990 Census and the Knox County population (including the City of Knoxville) was approximately 335,000 people. The Knoxville/Knox County Chamber Partnership estimated the 1997 population to be 169,000 and 365,000 respectively. In a population this size, numerous considerations were given to the task of selecting a random sample. Among the methods considered were referring to the phone book and selecting every n'th number based on the total population size, and a second system (random numbers) which was more statistically

defensible. It was determined that the first method contained inherent problems; (1) the phone book is only published once a year and could not be current; and (2) unlisted numbers were not accessible using this method. The random numbers method removes a considerable part of the first bias (prefixes can still be added from year to year) and all of the second bias.

The random number methodology followed the following format. First, the researcher obtained a listing of telephone prefixes in Knox County. In Knox County, there were 95 available recorded. These prefixes were obtained from the 1998-99 edition of the Knoxville and Vicinity telephone book. The prefixes included those listed for Concord, Halls Cross Roads, the City of Knoxville, Mascot, Powell, and Solway. The second step was to remove those prefixes that were obviously business prefixes. The third step in the process was to generate the random numbers themselves.

This procedure was accomplished using the following method. A list of all pertinent prefixes was generated and entered in a SAS statistical analysis software program. The SAS program was then programmed to generate random numbers for the last four digits of each prefix. On advice from the University of Tennessee Statistical Consulting Service, a sample size of four hundred was chosen for the Knox County population of 365,000 (estimated 1997 population). This method was designed to give an error of +/- 2.5. To obtain a sample size "n" of 400, a list of 2,000 telephone numbers was generated using the SAS random numbers method.

The intent of the sample size test was to give a sample size estimate within two standard deviations of the mean. To test the accuracy of the sample size, the following formula was used:

$$D = 2 [1.96 \sqrt{p \cdot q / n}]$$

Var (p) = $p \cdot q$ where $q = 1 - p$. p has a maximum value of $p = .5$.

$$p = .5 \text{ and } 1 - p = .5 \text{ so } (p \cdot q) = .5 * .5 = .25$$

To find the accuracy for a sample size of 400:

$d = 2 [1.96 * \sqrt{0.25/400}] = .98$ which yields an accuracy of $\pm .48$. that is within the acceptable range of $\pm 5\%$

III. INSTRUMENTATION

As described in Chapter 2, an exhaustive search of the literature led to the discovery of numerous existing HHW surveys. These surveys included face to face surveys at HHW collection centers; mail out surveys; and telephone surveys. The surveys ranged in depth from very basic questions, such as those asked at the collection center, to extensive surveys such as the Master Home Environmentalist Program, which is designed to be given by a surveyor to the home occupant for a substantial fee. This survey included a list of potential problems in a home and solutions to those problems. The survey form finally selected for use in this study, however, contained 24 questions and was developed by Tyris Environmental of Tucson, Arizona. It was selected as the best representative example of an existing survey form for the purposes of this study. Two open-ended questions were added to collect additional information from the sample population.

The Tyris survey was developed using input from a panel of thirteen persons selected from a number of backgrounds. This panel included:

1. the Pima (Arizona) Information Services Manager for the Pima County Department of Environmental Quality;
2. a representative from Zenitech Corporation;
3. the manager of the Pima County Business Section of the Main Library;
4. an Environmental Specialist with the Pima County Solid Waste Management Agency;
5. the Director of the Pima County Solid Waste Management office;
6. the Program Coordinator for the City of Tucson/Pima County Household Hazardous Waste Program;
7. a representative from the City of Tucson Solid Waste Management Office;
8. the Captain of the Tucson Fire Department;

9. the Assistant City Manager from Kansas City, Kansas;
10. a Tucson Pediatrician;
11. a representative from the University of Arizona Risk Management Agency;
12. a private citizen (homemaker);
13. a private citizen (writer).

The survey used for this project, HHW-003, (Appendix B) was developed under partial funding from the National Institutes of Health, the National Institute of Environmental Health Sciences, Grant Number 1 R43 ES07677-01. The current copy is the third edition of the survey. The survey used for the final portion of this study was slightly modified and formatted to an SPSS database.

Full-scale studies using this 24-question instrument have been conducted in Maricopa County, Arizona and Pima County, Arizona. The questions asked by the instrument covered every aspect of the HHW study area considered relevant by this researcher. The effort put into establishing validity of the document and the field testing of the instrument established an early measure of reliability deemed to be acceptable for the study.

IV. PROCEDURES FOR THE PILOT SURVEY

Procedures used for administering the pilot survey instrument were designed to be as specific as possible. The equipment needed for administration of the survey included: (1) one telephone; (2) one surveyor; (3) writing utensils; and (4) numerous blank survey forms. The surveyor was then trained in the administration of the instrument to encourage consistency, thereby increasing reliability of results.

Through an agreement with the Knox County Tennessee Solid Waste Division, a telephone and one surveyor was provided. The survey staff consisted of an intern working for the county. The survey staff member was trained to conduct the surveys using the following step by step procedure.

1. The telephone numbers were generated by SAS software in twenty-two "blocks." Each block consisted of an equal number of telephone numbers, (there were no duplicate numbers). While it is acknowledged that each of the 94 telephone prefixes used was representative of a different number of active telephone numbers associated with that prefix, the discrepancy in the data was erased (normalized) by the procedure itself. The each interviewer received the twenty-two blocks of numbers. The surveyor called across prefixes in the following manner 207-****, 212-****, 215-****, 218-****, from each block of numbers until one number from each of the ninety-four prefixes on that list was called. The interviewer then called all of the numbers that did not answer on the first round a second time, then repeat the calling across prefixes. The maximum number of times any particular number was called was three. After three calls, the interviewer marked the number on the chart as a non-response and continued down the list. With each individual calling from a separate number roster, and with no duplicate numbers existing, no numbers should have been called twice.

The procedure used in the calling should have yielded a normalized percentage of successful interviews. This percentage of successful interviews was representative of the number of active telephone numbers in each prefix zone.

2. Each survey form was labeled with an identification number. This number indicated the caller identification letter (A) and the form number (1 through 40). The survey sheets were numbered and coded before the calls began.
3. As per the instructions printed on the survey form, the interviewer, upon successful completion of the initiating call, the caller stated her name, and read the following script as closely as possible. "Hello, my name is _____, and I am conducting a survey for Knox County in association with the University of Tennessee about household product use and disposal. Do you live in Knox County?" (If not, terminate the interview).

4. The interviewer asked "are you at least 18 years old?"
5. The interviewer then stated "This will only take a few minutes, and all of the information you give me is confidential. Will you participate?" (If not, the interview was terminated).
6. A third reason for terminating the interview was the calling of a business number.
7. Before asking the first question, the interviewer read the following message. *"The project under which this survey was developed was partially supported by grant number 1 R43 ES0766-01 from the National Institutes of Health, National Institute of Environmental Health Sciences. This survey was developed by Tyrus Environmental, L.C."*
8. In asking question number one, the interviewer read a list of household products, one at a time, and asked the participant if he or she had bought the product in the last year. The acceptable answers were Yes, No, DK (don't know), and NR (no response).
9. In asking question number two; the interviewer asked the scripted question about the interviewee's disposal habits. Following the same category pattern as in question one, the interviewer read each of the five categories of materials (taken from question one) and added the appropriate code for the method used to dispose of the material (1 through 0).
10. Using the same category material list utilized in questions one and two, the interviewer asked the questions of how much material is "gotten rid of" (code number cross-referencing category and amount) and how often this material is gotten rid of. The code number for frequency is entered into the field below "how often."

11. Questions 4, 5, 6, 7, and 8 area all self-explanatory, were scripted and were answered with "Yes", "No", "Don't know," and "No response."
12. If the answer to question number 7 was "yes" the interviewer asked question number 8. If the answer is "no", the interviewer skipped to question number 13. *note, Knox County has a collection center. For the purposes of this survey, this response was a very important indicator from an educational health promotion standpoint. If a significant number of people were not aware of the center, one key to a future program in Knox County would be to promote awareness of the center.
13. Questions 8 through 12 yielded useful information on willingness and intent (attitude) towards using the site even if even for those who were unaware of its existence.
14. Questions 4 through 24 were demographic questions. After reading the script between questions 13 and 14, the interviewer needs to simply read the questions and record the answers.
15. The interviewer then recorded the answers to the open ended questions.
16. The last part of the survey was to thank the participant for his or her help in the study.

This pilot study used 10 % (40 people) of the main sample population to test the system. These data were logged in using the ACCESS database and the SPSS data analysis software. The data were collected, the information was logged into an EXCEL database. The statistical analysis was performed using SPSS software.

V. PILOT STUDY

The pilot study for the HHW telephone survey project began on January 27, 1999 and was completed on February 26, 1999. An intern at the Knox County, Tennessee Solid Waste Office administered the survey. During the course of the pilot study, several problems were identified and corrected. The pilot study identified problems with the method of choosing the sample (telephone numbers), with certain questions on the instrument. Improvements were instituted in the coding of the survey answers to facilitate data processing.

A. Methodology:

The method originally chosen for selecting telephone numbers, while statistically defensible, proved to be difficult for the single surveyor. The original sample of telephone numbers was generated using all known prefixes in Knox County. Each prefix was assigned four random suffix numbers using a SAS database. The original 2,000 numbers were chosen randomly and were statistically defensible. The inherent problem quickly became apparent. The telephone numbers were not exclusively residential numbers. The surveyor found that a very high percentage of the randomly generated numbers belonged to businesses, cellular phone customers, Fax machines and pager systems. Being randomly generated numbers, a large percentage of the numbers were inactive. The surveyor logged 12 successful interviews out of the first 400 calls, yielding a success rate of 3.0 percent.

The first attempt to correct the problem and raise the percentage of completed surveys was unsuccessful. BellSouth was contacted in an effort to eliminate those prefixes that had been assigned to specific entities, such as pager systems and cellular telephone providers. A representative of BellSouth explained that all prefixes are now randomly assigned, and the company no longer is allowed to group prefixes and assign those groups of prefixes to specific entities.

The second attempt to correct the problem was successful and retained statistical validity. It was determined that using a current BellSouth Knoxville Area telephone book (expiration date, December of 1999) was a better method of obtaining successful calls to residences. Using a SAS database, random numbers were generated for the starting page number (64), the starting column number (2), and the starting telephone number (48). Based on an estimated 180,800 residential telephone numbers in the Knox County sections of the Knoxville Area phone book, it was determined that by calling every 100th telephone number, it was likely that a random selection of participants could be selected from each area and each alphabetical grouping of the book. The surveyor was instructed to work from the assigned random start location, and work through the Knoxville listings, skipping the government pages, the business pages, and the Maynardville pages. The surveyors proceeded to the Concord listings, the Halls Cross Roads listings, and the Powell/Claxton listings. After completing the book, the surveyors began again with the Knoxville City listings.

By using this method, the success rate of the telephone calls jumped from 3.0 percent to 22.4 percent, with 28 of 125 calls resulting in completed surveys. This methodology change was incorporated into the revised procedure manual for the first portion of the full-scale study.

B. The instrument and associated coding considerations:

The instrument was found to be in need of minor modifications, and a coding system for answer categories on the instrument was developed to augment data analysis. On analyzing the problems encountered during the administration of the pilot study, the following was found to be helpful.

An EXCEL software program was used to create a spreadsheet designed to organize the data received from the pilot study. In the development of this program, it was necessary to build a database comprised of 43 fields. Into each field, a numerically

coded answer to each question was entered. These codes were assigned using the following methodology. Using question number one as an example, the possible answers to each category were assigned in the following manner. In response to the "I am going to read a list of household products. Can you tell me which of these products you've bought in the last year?" There were five categories of products that were read to the interviewee. There were four potential answers to each of the categorical questions. For the first category, automotive products, the database was assigned the variable name "autobuy." The possible answers for "autobuy" were "Yes" "No" "DK" (Don't Know) and "NR" (No Response). The possible answers were coded 1, 2, 3, and 0 respectively. Throughout the modified instrument, this pattern of four possible answers was represented using the same code numbers. Throughout the modified instrument "NR" or No Response was standardized as a numerical response of "0." This coding system was later revised for the computerized surveys conducted by the Social Sciences Research Institute (SSRI). The SSRI used a more developed coding system that was more compatible with the SPSS statistical analysis system than the original coding system.

Another problem noted during the survey was a tendency of the interviewees to give more than one response to a single question. As an example, people do use more than one method of product disposal, but for the purposes of statistical analysis, a question receiving more than one answer must be designated a non-response. The only other option would be to choose between the given answers. Choosing one answer or the other would bias the survey results. For this reason, the procedures were revised to include the statement; "Record only one answer per question. Multiple answers cannot be statistically analyzed." The electronic version of the survey eliminated this problem altogether. The system allowed only one answer per field in the database.

The only questions which were not assigned a numerical code were question numbers 17 (Zip code) which already had a designated numerical code assigned by the United

States Postal Service, question number 25 (which was open ended), and question number 26 (which was open ended).

On question number 8, it was determined that "NA" (not applicable) was a better categorical answer than "No Response." The question read "Do you use the collection?" It seemed a better category of response would be a matter of applicability rather than a lack of response. In addition, question number 8 included a subscript which read, "(Then skip to number 13)" This subscript implied that if a person was using the collection center, their opinions on question numbers 9 through 12 are not important. For the purposes of this survey, the information is valuable, even for a current user of the Knox County HHW collection center. The subscript after question number 8 was removed. A second subscript read "(If the response is no, then say)" implying that the surveyor should continue reading questions 10 through 12. This subscript was also removed as no longer pertinent in view of the fact that the first subscript was removed.

Question number nine required reevaluation. The question read "I am going to read two possible disposal options for these household wastes. (read one and two)

1. A collection day, held a few times a year, to bring your wastes into; or
2. A permanent collection site, open all year round, to bring wastes into.

Which of these options, if any, would you be most likely to use?"

The available options were:

- | | |
|--------------------|----------------|
| 1. "Collection day | 5. None |
| 2. Permanent site | 6. Don't know |
| 3. Curbside | 7. No response |
| 4. Other" | |

There were two problems with the question.

1. The question could have been written in a more concise manner.
2. The "Curbside" category was not an option in the original question.

The question was rewritten to read "Of the following disposal options for household hazardous wastes, which would you be more likely to use?"

- | | |
|--------------------|----------------|
| 1. "Collection day | 5. None |
| 2. Permanent site | 6. Don't know |
| 3. Curbside | 7. No response |
| 4. Other" _____ | |

There was a frequently occurring lack of response on question 10, leaving the researcher to wonder whether the question was intentionally skipped, as per the directions in the question 10 subscript, or if the question was simply not answered by omission. To address this concern, a change was made in the "Procedures" document given to the survey team for the main study. This change specified that all questions be addressed on the form in some way to insure that none were inadvertently omitted. This concern would be addressed by marking "No Response," "NR," Not Applicable," or "NA" on all question categories, thereby skipping no questions in their entirety.

On question number 23, the original survey form did not code race numerically. The codes assigned to race were (alphabetically):

- | | |
|----------------------------------|----------------|
| 1. American Indian/Eskimo Indian | 6. Other |
| 2. Asian/Pacific Islander | 7. Don't know |
| 3. Black | 0. No response |
| 4. Hispanic | |
| 5. White | |

There were two questions numbered 24 on the survey form used for the pilot study. The second question number 24 was labeled 25, and question number 25 was labeled 26, respectively.

Due to their text nature, questions 25 and 26 were not listed in the EXCEL database. These questions were addressed separately in the study, under the “participant comments” section.

D. Participant comments:

During the pilot study, 12 of 40 participants provided feedback on open ended question numbers 25, 26 or both. These are the responses to each question.

1. Responses to question 25 (listed on the pilot instrument erroneously as 24):

“How do you think this survey can be improved?”

- a) “Did fine – some kind of results needed instead of more surveys;”
- b) “No change needed;”
- c) “Don’t really know how it could be improved, would like to see the community become more knowledgeable of how to dispose of hazardous waste properly.”

2. Responses to question 26 (listed on the pilot instrument erroneously as 25):

“What Household Hazardous Materials issues would you like to know more about?”

- a) cleaning fluids dumped directly into drain – mainly concerned with what is going into Tennessee River;
- b) already very knowledgeable and conscientious about all issues;
- c) What are you supposed to do with household batteries?
- d) Pretty much aware of EPA standards. Don’t try to dispose of anything; try to use it all up & then recycle;
- e) All of it;
- f) Paint, batteries, and automotive products;
- g) Would like to be kept informed – has a whole bunch of shelves full of cans and stuff because he doesn’t want to throw in trash, but he also doesn’t know how to safely dispose of them;

- h) She keeps up with all that so she doesn't have any hazardous waste in her house;
- i) No – pretty careful already;
- j) Need to learn a lot about all of it;
- k) What to do with batteries;
- l) Yes, in general – what can and can't be safely disposed of in household trash;

The answers to these open ended questions appear to indicate a need for public education on household hazardous materials. These answers illuminate specific areas of interest which need to be addressed.

VI. POPULATION SELECTION METHODS

As described in the preceding section (II) of this chapter, two methods were used in the selection of study participants for the pilot study. It was necessary during the pilot study to alter the selection method due to the difficulties in using the randomly generated telephone number list (these difficulties were described in the previous section).

During the pilot study, the random number list method of choosing telephone numbers was replaced with a system using selection of telephone numbers from the BellSouth Knoxville Area telephone book. The end result was the development of a flexible, hybrid method of selecting of participants using both previously described methods.

During the main study, a reversal of methods was implemented. A hybrid method of selecting participants was deemed warranted. During collection of data for the main study, the first 50 successful surveys were completed using two surveyors and the telephone book method. This method worked quite well with the two surveyors.

The second group of participants in the main study (361) were selected using a professional survey service, the University of Tennessee Social Sciences Research

Institute (SSRI) and professional surveyors. Using these professional surveyors, the problems with using a telephone list were minimized. The professional surveyors utilized the prepared list of telephone numbers without apparent difficulty.

The end result was a hybrid method of selecting participants for the study. This hybrid system was flexible enough to accommodate individual surveyors and a team of professional surveyors.

VII. DATA ENTRY METHODS

A. Individual (non-professional surveyor) methods:

The individual surveyors entered the data using a survey form that evolved from the original form that had been developed by Tyrus Environmental. The modifications were subtle, and all modifications were made based on lessons learned during the pilot survey. The end product (hard copy) survey form is included in Appendix I.

The instructions used by individual non-professional surveyors for the data entry are outlined in figure 4B.

After the data was collected from the participants using these methods, the data was manually entered into an EXCEL database, after this data was entered into EXCEL, the data was converted to an SPSS statistical analysis program. Fifty of the surveys were conducted in this manner.

B. Professional surveyor methods:

The professional survey service (SSRI) used the same procedures and instruction sheet provided to the non-professional surveyors. These professional surveyors entered the data that they collected by converting the hard copy survey form into a computerized database. This method allowed the data to be directly inputted into a

useable SPSS database without the need to manually enter the data into EXCEL and convert the EXCEL file to SPSS. Instead of an instruction sheet (used for the non professional surveyors, the professional survey service developed a code book (see Appendix H). Three hundred sixty one of the surveys were conducted in this manner.

VIII. SUMMARY

The methodology used to conduct this study was designed to produce data that would be instrumental in targeting populations that had specific needs that could be addressed through a public education program. This public education program would be designed to increase awareness in the general public about the environmental and health hazards that are associated with improper use and disposal of Household Hazardous Materials. The study population consisted of residents of Knox County Tennessee and was conducted between January and July of 1999.

This study consisted of a survey conducted on a sample of the population in Knox County. This population was selected using telephone prefixes listed for Knox County in the 1998-1999 telephone book. The prefixes were listed. Random numbers for the last four digits in each area were generated using the SAS program. Through an agreement with the Knox County Solid Waste Division, interns in that office conducted the telephone interviews for the pilot study. The SSRI conducted 361 of 411 surveys for the main study.

The data generated by this study were used in planning of an educational program for Knox County Tennessee. The study was designed as a needs assessment for Knox County. The data were analyzed by cross-referencing numerous demographic categories with specific behavior and belief patterns in an attempt to identify areas of weakness in knowledge, behavior, and attitudes.

CHAPTER FOUR ANALYSIS OF DATA

I. INTRODUCTION

A study was conducted in the spring and summer of 1999 using a random selection of 411 Knox County Tennessee residents. This chapter is divided into the following sections: Introduction; I) demographic break down of the data; II) data; III) summary.

The pilot study and the main study took seven months to complete, and two methods were used to collect the data. The method used in the pilot study and eighty percent of the main study involved the use of random telephone number tables as is described in section Chapter 3. The second method used to randomly select participants for the study was a method using selected portions of the 1998-1999 Knoxville Area BellSouth telephone book. A professional statistician employed by the University of Tennessee confirmed that both methods were acceptable, approved, methodology. These methods were successful in selecting participants for the study.

The data analysis and results described in this chapter were calculated using the SPSS data analysis system. The data were collected in two forms. Three hundred sixty surveys were conducted using a computer entry program developed from the original survey form by the University of Tennessee Social Sciences Research Institute. These data were entered directly into the SPSS database. The remaining 50 surveys were conducted using two additional surveyors. These remaining 50 data points were logged using hard copy survey forms.

II. DEMOGRAPHIC PROFILE OF SAMPLE POPULATION

The demographic results of the sample population provided the following information. The respondents included 158 or 38.5% males and 252 or 61.5% females. The most frequently represented age group was 35 to 44. Twenty-one-point four percent of the respondents were in this age group. The majority of respondents, 120 or 29.3 % reported

that they had attended college, but had not graduated. The most frequently reported family income was \$50,000.00 or above, with 143 of the respondents, or 38.2% reporting that their income is in this category. Most of the respondents (292 or 71.4%) reported that they live in a single family home, followed by the second largest group (84 or 20.5%) reporting that they live in an apartment. Most of the respondents reported that they own their home (277 or 68.6%). Most respondents (142 or 34.7%) reported that two persons currently live in the home. Most respondents (342 or 83.8%) reported that no children under the age of six lived in the home. Demographic results are shown in Appendix J.

III. DATA

A. Categories of products bought:

As illustrated by table 4.1, respondents reported buying products in the following amounts. Of the 402 respondents participating in the survey, 79.8% or 324 reported buying automotive products during the last year, 82 respondents, or 20.2% reported that they did not purchase any of these products.

One hundred ninety of the participants, or 48.8%, reported buying paint-related products in the last year. Fifty-one point two percent reported that they bought no paint products.

Two hundred ten of the respondents, or 51.2%, reported buying pesticides or related products in the past year, and the remainder, 48.1%, did not buy these products.

The largest percentage of materials bought by households participating in the survey was household cleaners. Of the 402 participants, 374, or 91.7%, reported buying these products.

Household batteries were the second most commonly reported products purchased by the study group.

Table 4.1 Categories of products bought in 1998-1999

	Yes		No	
Automotive products	324	79.8	82	20.2
Paint products	198	48.8	208	51.2
Pesticides	210	51.9	195	48.1
Household cleaners	374	91.7	34	8.3
Household batteries	331	81.8	77	18.9
Other chemicals	30	7.4	378	92.6

Eighty-one point one percent of the respondents reported purchasing some type of household battery.

The smallest reported purchase group was titled miscellaneous. This category of products included photographic chemicals and swimming pool chemicals, among other not so common household hazardous materials. Only 7.4% of respondents reported purchasing these products in the last year.

B. Amount of automotive product left over:

The "frequencies of amounts left over" table 4.2 indicates that 268 of 411 respondents provided information on the question relating to the "amount of automotive products left over" therefore, the study yielded 268 valid data points in this column. One hundred eighty of 411 respondents provided information on the question relating to "amount of pesticides left over," yielding 180 valid data points. 190 valid data points were recorded for the category "amount of pesticides left over," 341 valid data points were recorded for "amount of batteries left over," and 28 valid data points were recorded for the category "amount of other chemicals left over."

Table 4.2 Amount of automotive product left over

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Use it all	135	32.8	50.4	50.4
	About a quart	73	17.8	27.2	77.6
	About a gallon	44	10.7	16.4	94.0
	1-5 gallons	11	2.7	4.1	98.1
	More than 5 gallons	5	1.2	1.9	100.0
	Total	268	65.2	100.0	
Missing	Missing	88	21.4		
	Don't know	55	13.4		
	Total	143	34.8		
Total		411	100.0		

1. Amount of automotive product left over: Of the 268 valid responses in the category "amount of automotive product leftover," slightly over half (50.4%) reported having used all of the product that they purchased. Twenty-seven point two percent of the respondents reported that they had "about a quart" left over. Sixteen point four percent of the respondents reported that they had "about a gallon" left over, and 4.1% reported that they had "1 to 5 gallons" of automotive product left over. The smallest group of respondents reporting in this category indicated that they had "more than 5 gallons" of product left over after using automotive products.

2. Amount of paint products left over:

Of the 180 valid responses in the category, "amount of paint product left over," slightly over one third (33.9%) of the respondents reported that they used all of the product. Twenty eight point nine percent of the respondents reported that they had about a quart of the paint product left over, 20.6% reported that they had about a gallon of paint product left over, 11.1% of the respondents reported having 1 to 5 gallons of paint product left over, and 5.6% reported having more than 5 gallons of paint product left over.

3. Amount of pesticides left over:

Of the 190 valid responses in the category, "amount of pesticides left over," more than half (59.5%) reported using all of the product. Twenty two point one percent of the respondents reported having about a quart of pesticide product left over, 11.6% of the respondents reported having about a gallon of pesticide product left over, 5.6% reported having 1 to 5 gallons left over, and less than 2.0% (1.6%) reported having more than 5 gallons of pesticide product left over.

4. Amount of cleaner left over:

Of the 341 valid responses in the "amount of cleaner left over" category, 59.5% of the respondents reported using all of the product. Thirty-four point six percent of the respondents reported having about a quart of cleaning products left over after a job is completed. Three point five percent of respondents report having about a gallon of cleaning product left over, 1.8% of the respondents reported having 1 to 5 gallons of cleaning materials left over, and less than 1.0% (.6) reported having more than 5 gallons of product left over.

5. Number of household batteries left over:

Of the 310 valid responses in the "number of household batteries left over" category, 36.8% of the respondents reported having "1 to 5" batteries left over in the last year. Twenty four point two percent of the respondents reported having "6 to 10" batteries left over in the last year. Twelve point nine percent of the respondents reported having "11 to 15" batteries left over in the last year. Si point eight percent of the respondents reported having "16 to 20" batteries left over in the last year, and 18.1% reported having "over 20" batteries left over in the last year. One point three percent of the respondents reported that they "have not disposed of any" batteries in the last year.

6. Amount of other chemicals left over:

Of the 28 valid responses reported in the "amount of chemicals left over" category, 78.6% reported that they used all of the product(s). Seven point one percent reported having about a quart left over, 7.1% reported having about a gallon left over, 3.6% reported having 1 to 5 gallons leftover, and 3.6% reported having more than 5 gallons of product left over in the last year.

C. Disposal of products:

The "products disposal table," table 4.3, illustrates the methods that study participants reported using to dispose of left over product(s). The "frequencies table," table 4.4, illustrates the frequencies of "valid" reported data per product category and further illustrates the frequency of "missing" data reported per product category.

The structure of product category questions required that a "skip command" be placed on the computer data collection system for those portions of questions that were not applicable to the respondent. For example, if a respondent reported that they did not have any product left over from a purchase, or that they "used it all" from a particular product category, the sub-question from that category, disposal methods, would not be applicable. These "not applicable" data were labeled "missing" on the table. The "skip command" allowed the interviewer to skip the secondary portion of the question when needed. The "skip command" automatically placed the code number "9" in that data field to indicate that the data for this data was missing. By default, missing data is not valid data, therefore, this data of interest to the study is labeled "Valid Percent." In the "Frequencies" table 4.4, the valid percent of respondents for "disposal of automotive products" is 194 out of 411. The "disposal of paint products" category illustrates that 147 of 411 respondents disposed of paint products. One hundred seventeen of 411 respondents disposed of pesticides, 200 of 411 respondents disposed of cleaners, 312 of 411 respondents disposed of household batteries, and only 9 of 411 respondents disposed of products in the "other" category.

Table 4.3 Products disposal table

		Regular garbage pick up	Landfill	Pour in back yard	Pour in sink	Put away for later use / disposal	Gave to someone else
Disposal of auto products	count	26	4	3	0	65	15
	%	13.4	2.1	1.5	.0	33.5	7.7
Disposal of paint products	count	10	2	0	0	95	9
	%	6.8	1.4	.0	.0	64.6	6.1
Disposal of pesticides	count	5	0	2	1	69	20
	%	4.3	.0	1.7	.9	59.0	17.1
Disposal of cleaners	count	25	1	0	6	107	32
	%	12.5	.5	.0	3.0	53.5	16.0
Disposal of household batteries	count	258	8	0	0	1	4
	%	82.7	2.6	.0	.0	.3	1.3
Disposal of other chemicals	count	0	0	0	0	6	0
	%	.0	.0	.0	.0	66.7	.0

Table 4.4 Frequencies of Response to Disposal Question

		Disposal of auto products	Disposal of paint products	Disposal of pesticides	Disposal of cleaners	Disposal of household batteries	Disposal of other chemicals
N	Valid	194	147	117	200	312	9
	Missing	217	264	294	211	99	402

The balances of these numbers 221, 268, 298, 215, 103, and 406, respectively, indicate the "missing" data for each corresponding category.

This seemingly large amount of missing data is directly attributable to the fact that not everyone has product left over from a purchase to dispose of. The data taken from these disposal tables is presented in text format in the following sections of this study. This text format ranks the tabulated data from the most common disposal method per product category to the least common disposal method per product category.

1. Disposal of automotive products:

The "Valid Percent" data in the "disposal of auto products" table, 4.5, illustrates that the 194 respondents who reported disposing of automotive products were most likely to dispose of left over products by "putting away for later disposal" (33.5%). Thirty one point four percent of respondents reported that left over products were "recycled or turned in to a Household Hazardous Waste (HHW) collection center." Thirteen point four percent of the respondents reported putting left over automotive products in the regular "garbage pick up." Seven point seven percent reported giving the products to someone else as a means of disposal, and 2.1% of respondents reported taking the left over products to the landfill. One point five percent reported pouring the left over product in the backyard, and no one reported pouring and automotive product down the sink. Ten point three percent reported "other" means of automotive product disposal.

2. Disposal of paint products:

The "Valid Percent" data in the "disposal of paint products" table 4.6, illustrates that of the 147 persons who reported disposing of these products, 64.6% of the respondents reported saving paint products for later use and/or disposal. The second most common method (16.3%) study participants reported using for disposal of paint products was recycling or turning in to a Household Hazardous

Table 4.5 Disposal of Automotive Products

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Put away for later use or disposal	65	15.8	33.5	33.5
	Recycled or turned in to a HHW collection center	61	14.8	31.4	64.9
	Garbage pick up	26	6.3	13.4	78.4
	Other	20	4.9	10.3	88.7
	Gave to someone else	15	3.6	7.7	96.4
	Landfill	4	1.0	2.1	98.5
	Pour in back yard	3	.7	1.5	100.0
	Total	194	47.2	100.0	
Missing	Missing	217	52.8		
Total		411	100.0		

Table 4.6 Disposal of Paint Products

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Put away for later use or disposal	95	23.1	64.6	64.6
	Recycled or turned in to a HHW collection center	24	5.8	16.3	81.0
	Garbage pick up	10	2.4	6.8	87.8
	Gave to someone else	9	2.2	6.1	93.9
	Other	7	1.7	4.8	98.6
	Landfill	2	.5	1.4	100.0
	Total	147	35.8	100.0	
Missing	Missing	264	64.2		
Total		411	100.0		

Waste Collection Center. Six point eight percent of respondents reported putting the left over paint product into the regular garbage, and 6.1% of the respondents gave the product to someone else. One point four percent reported taking the products to the landfill, and no one (0%) reported either pouring the products down the sink, or pouring the left over product in the back yard. Four point eight percent of respondents reported using other methods to dispose of the left over product.

3. Disposal of pesticides:

The "Valid Percent" data in the "Disposal of Pesticides" table, 4.7 illustrates that of the 298 persons who reported disposing of pesticides, 59% of the respondents choose to delay disposal of the materials by selecting the put away for later use option. With such a large percentage of respondents choosing this option, the ultimate fate of the materials is impossible to determine. The second most commonly given response was, gave to someone else, with 17.1% of the respondents choosing to dispose of products in this manner. Eleven point one percent of the respondents chose to dispose of the pesticides in a manner other than those listed. Six percent of the respondents chose to recycle or turn the materials into a HHW collection center, and 4.3% placed the materials in the garbage for regular pick up. One point seven percent of the respondents poured pesticides in the back yard, and .9% poured excess product down the sink.

4. Disposal of cleaners:

The "Valid Percent" data in the "disposal of cleaners" table 4.8 illustrates that 53% of the 200 persons who reported disposing of cleaning products disposed of the left over product by putting the material away for later disposal. Sixteen percent of the respondents reported giving excess product to someone else, and 12.5% of the respondents reported putting the excess product in the garbage for

Table 4.7 Disposal of Pesticides

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Put away for later use or disposal	69	16.8	59.0	59.0
	Gave to someone else	20	4.9	17.1	76.1
	Other	13	3.2	11.1	87.2
	Recycled or turned in to a HHW collection center	7	1.7	6.0	93.2
	Garbage pick up	5	1.2	4.3	97.4
	Pour in back yard	2	.5	1.7	99.1
	Pour in sink	1	.2	.9	100.0
	Total	117	28.5	100.0	
Missing	Missing	294	71.5		
Total		411	100.0		

Table 4.8 Disposal of Cleaners

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Put away for later use or disposal	107	26.0	53.5	53.5
	Gave to someone else	32	7.8	16.0	69.5
	Garbage pick up	25	6.1	12.5	82.0
	Recycled or turned in to a HHW collection center	17	4.1	8.5	90.5
	Other	12	2.9	6.0	96.5
	Pour in sink	6	1.5	3.0	99.5
	Landfill	1	.2	.5	100.0
	Total	200	48.7	100.0	
Missing	Missing	211	51.3		
Total		411	100.0		

regular pick up. Six percent of the respondents reported using other methods of disposal, 3.0% poured excess product down the sink, and .5% reported taking excess product to the landfill.

5. Disposal of household batteries:

The "Valid Percent" data in the "disposal of household batteries" table 4.9 illustrates that of the 312 persons reporting having disposed of batteries, 82.7 percent disposed of them in the garbage for regular pick up. Ten point six percent of the respondents disposed of the batteries by choosing the recycled or turned in to a HHW collection center category. Two point six percent of the respondents reported taking used batteries to the landfill, 2.6% chose other methods of disposing of the batteries, and 1.3% reported giving the batteries to someone else. Point three percent reported putting the batteries away for later disposal.

6. Disposal of other chemicals:

Only 28 of 411 persons reported disposing of "other chemicals" in the "disposal of

Table 4.9 Disposal of Household Batteries

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Garbage pick up	258	62.8	82.7	82.7
	Recycled or turned in to a HHW collection center	33	8.0	10.6	93.3
	Landfill	8	1.9	2.6	95.8
	Other	8	1.9	2.6	98.4
	Gave to someone else	4	1.0	1.3	99.7
	Put away for later use or disposal	1	.2	.3	100.0
	Total	312	75.9	100.0	
Missing	Missing	99	24.1		
Total		411	100.0		

other chemicals" table 4.10. This table illustrates that of these 28 persons, 66.7% put the chemicals away for later use or disposal and 22.2% recycled or turned the excess product in to a HHW collection center. The remaining 11.1% of the respondents reported using other means of disposal for these products.

D. Products cause pollution:

Table 4.11 illustrates the responses to the question "Do you think these products cause pollution?" This table shows that of the 411 respondents, 410 valid responses were tabulated. 38 responses were labeled "missing." Among these valid responses, 93.9% indicated that they believed these products cause pollution. Six point one percent of the respondents did not believe that these products cause pollution. Eight percent of the respondents were "not sure" if the products cause pollution.

E. Products cause health problems:

Table 4.12 illustrates the results of responses to the question "Do you think these products cause health problems?" Due to an error in converting the paper survey form to an electronic format, the question asking the respondents if they believed

Table 4.10 Disposal of Other Chemicals

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Put away for later use or disposal	6	1.5	66.7	66.7
	Recycled or turned in to a HHW collection center	2	.5	22.2	88.9
	Other	1	.2	11.1	100.0
	Total	9	2.2	100.0	
Missing	Missing	402	97.8		
Total		411	100.0		

Table 4.11 Do these HHW products cause pollution?

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Yes	354	86.1	86.3	86.3
	No	23	5.6	5.6	92.0
	Not sure	33	8.0	8.0	100.0
	Total	410	99.8	100.0	
Missing	Refused / Missing	1	.2		
Total		411	100.0		

Table 4.12 Do these HHW products cause health problems?

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Yes	37	9.0	74.0	74.0
	No	5	1.2	10.0	84.0
	Don't know	8	1.9	16.0	100.0
	Total	50	12.2	100.0	
Missing	No response	1	.2		
	System	360	87.6		
	Total	361	87.8		
Total		411	100.0		

that these products cause health problems was lost. The result was that in the 361 electronic surveys taken, the question was omitted. In the 50 paper surveys, the question was included. Based on this limited data, 49 valid responses were recorded, 35 persons, or 70% of the respondents, indicated that they did believe that these products cause health problems. Twelve percent of the respondents replied that they did not believe that these products cause health problems, and 16% replied that they were not sure if these products cause health problems. One data point, or 2.0% of the data was missing.

F. Aware of Knox County collection center:

Table 4.13 illustrates valid versus missing data points for the question "Aware of collection center?" Four hundred ten valid data points and one missing data point were recorded in this category. This table also illustrates that of the 410 valid responses, 28.5% of the respondents were aware that Knox County has a HHW collection center. Twenty four point one percent of the valid responses were recorded as replying that Knox County did not have a HHW collection center, and 47.3% of the respondents did not know whether Knox County has a collection center or not.

Table 4.13 Aware of collection center for HHW products?

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Yes	117	28.5	28.5	28.5
	No	99	24.1	24.1	52.7
	Not sure	194	47.2	47.3	100.0
	Total	410	99.8	100.0	
Missing	Refused / missing	1	.2		
Total		411	100.0		

G. Distance willing to travel to a collection center:

Table 4.14 shows valid versus invalid data points for the question "How far would you be willing to travel to use a Household Hazardous Waste collection center?"

The table shows that 380 valid data points were collected from 411 surveys and that 31 responses were recorded as missing. This table also shows that of these 380 valid data points, 54.7% of the respondents indicated that they would drive between "0 and 15" miles to use a collection center. Twenty-eight point two percent of the respondents indicated that they would be willing to travel "5 to 10" miles to use a collection center; 9.5% of the respondents indicated that they would be willing to travel "10 to 15" miles to use a collection center; and 7.6% of the respondents indicated that they would be willing to travel "over 15" miles to use a collection center.

H. Number of times per year you would use a collection center:

Table 4.15 illustrates valid versus invalid data points for the question "number of times per year you would use a collection site" The table shows that 370 valid data points were collected, and that 45 data points were missing. This table also shows that 18.1% of the respondents indicated that they would use a collection center one time a year. Twenty-one point four indicated that they would use the collection center two times a year. Eighteen point nine percent of the respondents indicated that they would use a collection center three times a year, and 41.6% of the respondents indicated that they would use the center more than three times a year. Seven point one percent of the people did not know how many times a year they would use such a center.

I. Education * awareness:

Table 4.16 illustrates the breakdown of educational attainment categories, and cross tabulates those categories with "awareness of collection center." The table

Table 4.14 Distance willing to travel to use a HHW collection center

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	0-5 miles	208	50.6	54.7	54.7
	5-10 miles	107	26.0	28.2	82.9
	10-15 miles	36	8.8	9.5	92.4
	over 15 miles	29	7.1	7.6	100.0
	Total	380	92.5	100.0	
Missing	Don't know	21	5.1		
	Refused / missing	10	2.4		
	Total	31	7.5		
Total		411	100.0		

Table 4.15 Number of times per year you would use a HHW collection center

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Once	67	16.3	18.1	18.1
	Twice	79	19.2	21.4	39.5
	Three times	70	17.0	18.9	58.4
	More than three times	154	37.5	41.6	100.0
	Total	370	90.0	100.0	
Missing	Don't know	31	7.5		
	Refused / missing	10	2.4		
	Total	41	10.0		
Total		411	100.0		

shows that those persons with post-graduate degrees are more likely to be aware of the existence of a collection center in Knox County than the other groups (adjusted residual 1.9), but that difference is not significant. The Pearson chi-square test showed a result of 6.554 with 10 degrees of freedom and a p-value of (.767).

J. Own home * awareness:

The data illustrated in table 4.17 compares home owners to home renters. These two groups are compared on their awareness of the collection center. The data shows that fewer renters than expected are aware of the existence of a collection center in Knox County (adjusted residual -3.7), and that more home owners than expected were aware of the collection center (adjusted residual 3.7). These differences were significant. The Pearson chi square test shows results were tabulated to be 13.501 with 2 degrees of freedom and a p-value of (.001).

K. Age * awareness:

The data illustrated in table 4.18 compared the various age groups represented by the sample. The table then shows the result of a cross tabulation between these age groups and awareness of the center. The table shows that fewer people in the 18-34 age group than would be expected (adjusted residual -3.6) are aware of the collection center in Knox County. In the age 55 and over age group, more people than would be expected (adjusted residual 3.1) are aware of the collection center in Knox County. These differences are statistically significant. The Pearson chi-square test value was 18.110, with 4 degrees of freedom. The p-value is (.001).

Table 4.16 Education * Aware of HHW collection center - Cross-tabulation

			Aware of collection center			
			Yes	No	Not sure	Total
Education	Did not finish high school	Count	9	11	19	39
		% within education	23.1%	28.2%	48.7%	100.0%
		% within aware of collection center	7.7%	11.2%	9.8%	9.5%
		Adjusted residual	-.8	.7	.2	
	High school diploma	Count	26	25	43	94
		% within education	27.7%	26.6%	45.7%	100.0%
		% within aware of collection center	22.2%	25.5%	22.2%	23.0%
		Adjusted residual	-.2	.7	-.4	
	Some college, no degree	Count	36	25	59	120
		% within education	30.0%	20.8%	49.2%	100.0%
		% within aware of collection center	30.8%	25.5%	30.4%	29.3%
		Adjusted residual	.4	-1.0	.5	
	Associate degree	Count	7	6	15	28
		% within education	25.0%	21.4%	53.6%	100.0%
		% within aware of collection center	6.0%	6.1%	7.7%	6.8%
		Adjusted residual	-.4	-.3	.7	
	Bachelor's degree	Count	19	22	37	78
		% within education	24.4%	28.2%	47.4%	100.0%
		% within aware of collection center	16.2%	22.4%	19.1%	19.1%
		Adjusted residual	-.9	1.0	.0	
	Post graduate degree	Count	20	9	21	50
		% within education	40.0%	18.0%	42.0%	100.0%
		% within aware of collection center	17.1%	9.2%	10.8%	12.2%
		Adjusted residual	1.9	-1.1	-.8	
Total		Count	117	98	194	409
		% within education	28.6%	24.0%	47.4%	100.0%
		% within aware of collection center	100.0	100.0	100.0%	100.0%
			%	%		
		value	df		Asymp. Sig. (2 sided)	
Pearson chi square		6.554	10		.767	

Table 4.17 Own home * Aware of HHW collection center - Cross-tabulation

			<u>Aware of collection center</u>			
			Yes	No	Not sure	Total
Own or rent?	Rent	Count	21	35	71	127
		% within own or rent	16.5%	27.6%	55.9%	100.0%
		% within aware of collection center	18.1%	35.7%	37.4%	31.4%
		Adjusted residual	-3.7	1.0	2.4	
	Own	Count	95	63	119	277
		% within own or rent	34.3%	22.7%	43.0%	100.0%
		% within aware of collection center	81.9%	64.3	62.6%	68.6%
		Adjusted residual	3.7	-1.0	-2.4	
Total		Count	116	98	190	404
		% within own or rent	28.7%	24.3%	47.0%	100.0%
		% within aware of collection center	100.0 %	100.0 %	100.0%	100.0%
		value	df		Asymp. Sig. (2 sided)	
Pearson chi square		13.501	2		.001	

Table 4.18 Age * awareness of HHW collection center - Cross-tabulation

			<u>Aware of collection center</u>			
			Yes	No	Not sure	Total
Age	18-34	Count	19	28	71	118
		% within age	16.1%	23.7%	60.2%	100.0%
		% within aware of collection center	16.4%	29.5%	37.2%	29.4%
		Adjusted residual	-3.6	.0	3.3	
	35-54	Count	49	42	71	162
		% within age	30.2%	25.9%	43.8%	100.0%
		% within aware of collection center	42.2%	44.2%	37.2%	40.3%
		Adjusted residual	.5	.9	-1.2	
	55 and over	Count	48	25	49	122
		% within age	39.3%	20.5%	40.2%	100.0%
		% within aware of collection center	41.4%	26.3%	25.7%	30.3%
		Adjusted residual	3.1	-1.0	-1.9	
Total		Count	116	95	191	402
		% within age	28.9%	23.6%	47.5%	100.0%
		% within aware of collection center	100.0%	100.0%	100.0%	100.0%
			%	%		
		value	df		Asymp. Sig. (2 sided)	
Pearson chi square		18.110	4		.001	

L. Own or rent * number of times you would use a collection center:

Table 4.19 shows that when a cross tabulation between owners, renters, and the number of times a Knox County resident is likely to use a collection site. The calculations do not yield significant results. While the Pearson chi-square test yielded a value of 4.523 with 3 degree of freedom, the p-value was not significant at (.210).

Even though the overall values do not show significance, some individual values do yield further information about the number of times a homeowner is willing to use a collection site per year as compared to a renter. The table indicates that in three of four frequency categories, homeowners are more likely to use a collection center for HHW than renters. These numbers show that of the respondents within the own or rent category, 13.3% of renters are likely to use the collection center once a year as opposed to 19.4% of the homeowners. The percentage of these people who indicated that they were likely to use the center twice a year were (19.5%) renters and (22.5%) owners. The percentage of people who indicated that they would be likely to use the collection facility three times per year were (17.7% renters) and (19.8% owners). The largest difference in the two groups was found in the "willingness to use a collection site more than three times" category. In this category, the previous trend reversed, with (49.6%) of the renters expressing a willingness to use a collection site more than three times, and 38.8% of the homeowners expressing a willingness to do so. The adjusted residual on these two groups of people in this last category was 2.0 renters and -2.0 home owners.

M. Own or rent * distance willing to travel to reach a collection center:

Table 4.20 illustrates the results of the collected data as it relates home owners, and those who rent homes, to the distance that the participants indicated they were willing to drive to use a collection center. Among the 375 valid data points, 52.1% of renters indicated that they were willing to drive 0 to 5 miles to use a collection center. Twenty two point two percent of the renters indicated that they were willing to

Table 4.19 Own or rent * Number of times in a year you would use a HHW collection center Cross-tabulation

Number of times per year you would use a collection center							
			Once	Twice	Three	Over three	Total
Own or rent	Rent	Count	15	22	20	56	113
		% within own or rent	13.3%	19.5%	17.7%	49.6%	100.0%
		% within number of times per year you would use a collection center	23.4%	27.8%	28.6%	36.6%	30.9%
		Adjusted residual	-1.4	-.7	-.5	2.0	
	Own	Count	49	57	50	97	253
		% within own or rent	19.4%	22.5%	19.8%	38.3%	100.0%
		% within number of times per year you would use a collection center	76.6%	72.2%	71.4%	63.4%	69.1%
		Adjusted residual	1.4	.7	.5	-2.0	
Total		Count	64	79	70	153	366
		% within own or rent	17.5%	21.6%	19.1%	41.8%	100.0%
		% within number of times per year you would use a collection center	100.0%	100.0%	100.0%	100.0%	100.0%
		Value	df		Asymp. Sig. (2 sided)		
Pearson chi square		4.523	3		.210		

Table 4.20 Own or rent * distance willing to travel to use a HHW collection center Cross-tabulation

Number of times per year you would use a collection center							
			0-5 miles	5-10 miles	10-15 miles	over 15 miles	Total
Own or rent	Rent	Count	61	26	14	16	117
		% within own or rent	52.1%	22.2%	12.0%	13.7%	100.0 %
		% within distance willing to travel to reach a collection center	29.8%	24.5%	38.9%	57.1%	31.2%
		Adjusted residual	-.7	-1.8	1.0	3.1	
	Own	Count	144	80	22	12	258
		% within own or rent	55.8%	31.0%	8.5%	4.7%	100.0 %
		% within distance willing to travel to reach a collection center	70.2%	75.5%	61.1%	42.9%	68.8%
		Adjusted residual	.7	1.8	-1.0	-3.1	
Total		Count	205	106	36	28	375
		% within own or rent	54.7%	28.3%	9.6%	7.5%	100.0 %
		% within distance willing to travel to reach a collection center	100.0%	100.0%	100.0 %	100.0 %	100.0 %
		Value	df		Asymp. Sig. (2 sided)		
Pearson chi square		12.168	3		.007		

drive between 5 and 10 miles to use a collection center, 12.0% of the renters indicated that they were willing to drive between 10 and 15 miles to use a collection center, and 13.7% indicated that they were willing to drive over 15 miles to use a collection center. The adjusted residual value was high in one category of distance, scoring a (3.1). This score indicates that an unexpected number of renters expressed a willingness to drive over 15 miles to use the center.

Table 4.20 also shows that among homeowners, 55.8% of the respondents indicated that they would be willing to drive between 0 and 5 miles to use a collection center. Thirty-one percent indicated that they would be willing to drive 5 to 10 miles to use a collection center; 8.5% indicated that they would be willing to drive between 10 and 15 miles to use a collection center; and only 4.7% indicated that they would be willing to drive over 15 miles to use a collection center. The adjusted residual value was low in only one category of homeowners (-3.1), with only 4.7% of the homeowners willing to drive over 15 miles to use a collection center. This low residual value indicates that fewer homeowners than expected indicated a willingness to drive over 15 miles to use the center.

The Pearson chi-square test showed statistically significant results in this table. The Pearson chi square value was 12.168 with 3 degrees of freedom and a p-value of (.007).

N. Age * distance willing to travel to a collection center

Table 4.21 shows that of 372 valid responses, 43.8% of those respondents 18 to 34 were willing to drive from 0 to 5 miles to use a collection center. Twenty-nine point five percent of the respondents were willing to drive between 5 and 10 miles to use a collection center, 15.2% of those persons 18 to 34 were willing to drive 10 to 15 miles to use a collection center, and 11.6% of those persons indicated a willingness to

Table 4.21 Age * distance willing to travel to use a HHW collection center

			<u>Distance willing to travel to collection center (in miles)</u>				
			0-5	5-10	10-15	over 15	Total
Age	18-34	Count	49	33	17	13	112
		% within age	43.8%	29.5%	15.2%	11.6%	100.0%
		% within travel distance	24.0%	31.7%	47.2%	46.4%	30.1%
		Adjusted residual	-2.8	.4	2.4	2.0	
	35-54	Count	82	48	16	10	156
		% within age	52.6%	30.8%	10.3%	6.4%	100.0%
		% within travel distance	24.0%	46.2%	44.4%	35.7%	41.9%
		Adjusted residual	-.7	1.0	.3	7.7	
	55 and over	Count	73	23	3	5	104
		% within age	70.2%	22.1%	2.9%	4.8%	100.0%
		% within travel distance	35.8%	22.1%	8.3%	17.9%	28.0%
		Adjusted residual	3.7	-1.6	-2.8	-1.2	
Total		Count	204	104	36	28	372
		% within age	54.8%	28.0%	9.7%	7.5%	100.0%
		% within travel distance	100.0 %	100.0 %	100.0 %	100.0 %	100.0%
		value	df			Asymp. Sig. (2 sided)	
Pearson chi square		21.203	6			.002	

drive over 15 miles to use a collection center. The data showed two unexpected results in this section of the data table. The unexpected results occurred in the 0 to 5 mile category, with less than the expected number of respondents indicating a willingness to travel 0 to 5 miles. The adjusted residual was calculated at (-2.8). The results showed a higher than expected number of respondents expressing a willingness to travel 10 to 15 miles. The adjusted residual score was 2.4 in this category.

The second section of table 4.21 shows that among those persons in the 35 to 54 age group, 52.6% were willing to drive 0 to 5 miles to use a collection center. Thirty point eight percent of those persons in this age group expressed a willingness to travel between 5 and 10 miles to use a collection center, and 10.3% expressed a willingness to drive 10 to 15 miles to use a collection center. Six point four percent of the respondents expressed a willingness to travel over 15 miles to use the collection center. There were no unexpected results in this age group.

The third section of table 4.21 shows that among those respondents who were in the age 55 and older category, 70.2% were willing to drive 0 to 5 miles to use a collection center. Twenty two point one percent of the respondents in this group expressed a willingness to travel between 10 and 15 miles to use a collection center; 2.9% of the respondents in this group expressed a willingness to travel 10 to 15 miles to use a center, and 4.8% of the respondents expressed a willingness to travel over 15 miles to use a collection center. The unexpected results in the 55 and over age group were limited to the first category (0 to 5 miles). The table shows that for this category, more people than would be expected indicated a willingness to drive 0 to 5 miles to use a collection center (adjusted residual 3.7). The table also shows that fewer people in this age group than would be expected

indicated that they would be willing to drive 10 to 15 miles to use a collection center (adjusted residual -2.8).

The data were tested for significance using the Pearson chi-square test. The chi square test showed a statistically significant result at 12.168, with 6 degrees of freedom and a p-value of (.002).

O. Education * distance willing to travel to a collection center

Table 4.22 illustrates that the educational achievement of participants was broken up into six categories. Of those respondents that did not finish high school, 75% indicated that they would drive 0 to 5 miles to use a collection center. Fifteen point six percent indicated that they would be willing to travel 5 to 10 miles to use a collection center, and 9.4% indicated that they would be willing to drive over 10 miles to use a collection center. The only unexpected data received from this educational group was in the 0 to 5 mile category. The adjusted residual for this category was (2.4), indicating that more people from this educational category than expected would be willing to drive 0 to 5 miles to use a collection center.

Of those respondents that received a high school diploma, 53.5% indicated that they were willing to drive 0 to 5 miles to use a collection center. Twenty-five point six percent of the respondents indicated that they were willing to drive 5 to 10 miles to use a collection center, and 20.9% indicated that they were willing to drive over 10 miles to use the center. The adjusted residual values did not show any unexpected values in this educational group.

Of those respondents who attended college, but did not receive a degree, 59.6% expressed a willingness to travel 0 to 5 miles to use a collection center. Twenty- nine point two percent expressed a willingness to travel 5 to 10 miles to use a collection

Table 4.22 Education * distance willing to travel to use a HHW collection center Cross-tabulation

<u>Travel distance to collection center (in miles)</u>						
			0-5	5-10	over 10	Total
Education	Did not finish high school	Count	24	5	3	32
		% within education	75.0%	15.6%	9.4%	100.0%
		% within site				
		distance	11.6%	4.7%	4.6%	8.4%
		Adjusted residual	2.4	-1.7	-1.2	
	High school diploma	Count	46	22	18	86
		% within education	53.5%	25.6%	20.9%	100.0%
		% within site				
		distance	22.2%	20.6%	27.7%	22.7%
		Adjusted residual	2.4	-.6	1.1	
	Some college, no degree	Count	67	33	13	113
		% within education	59.3%	29.2%	11.5%	100.0%
		% within site				
		distance	32.4%	30.8%	20.0%	22.7%
		Adjusted residual	1.2	.3	-1.9	
	Associate degree	Count	13	11	2	26
		% within education	50.0%	42.3%	7.7%	100.0%
		% within site				
		distance	6.3%	10.3%	3.1%	6.9%
		Adjusted residual	-.5	1.7	-1.3	
	Bachelor's degree	Count	34	17	26	77
		% within education	44.2%	22.1%	33.8%	100.0%
		% within site				
		distance	16.4%	15.9%	40.0%	20.3%
		Adjusted residual	-2.1	-1.3	4.3	
	Post graduate degree	Count	23	19	3	45
		% within education	51.1%	42.2%	6.7%	100.0%
		% within site				
		distance	11.1%	17.8%	4.6%	11.9%
		Adjusted residual	-.5	2.2	-2.0	
Total		Count	207	107	65	379
		% within education	54.6%	28.2%	17.2%	100.0%
		% within site	100.0	100.0	100.0%	100.0%
		distance	%	%		
		value	df		Asymp.Sig. (2 sided)	
Pearson chi square		33.263	10		<.001	

center, and 11.5% expressed a willingness to travel over 10 miles to use a collection center. The adjusted residual values did not show that any results were unexpected from this educational group.

Of those who received an associate degree from an institution, 50.0% expressed a willingness to travel 0 to 5 miles to use a collection center. Forty-two point three percent expressed a willingness to travel 5 to 10 miles to use a collection center, and 7.7% expressed a willingness to travel over 15 miles to use a collection center. The adjusted residual values did not show any unexpected results from this educational group.

Of those respondents who received a bachelor's degree from an institution, 44.2% indicated that they would be willing to travel from 0 to 5 miles to use a collection center. Twenty-two point one percent of these respondents indicated that they would be willing to travel 5 to 10 miles to use a collection center, and 33.8% indicated that they would be willing to travel over 10 miles to visit a collection center. The data in this set indicated two unexpected results as evidenced by the adjusted residual values. The first unexpected result was in the category of 0 to 5 miles. The adjusted residual value for this category was -2.1, indicating that fewer respondents than expected would be willing to travel this distance to dispose of these materials. The second unexpected value in the bachelor's degree category is evidenced by the over 10 miles category, where an adjusted residual value showed a much higher than expected value of (4.3).

The last educational grouping that table 4.22 illustrates is the "post graduate degree" grouping. The data for this category shows that 51.1% of the respondents were willing to travel 0 to 5 miles to use a collection center, 42.2% of the respondents were willing to travel 5 to 10 miles to use the collection center, and 6.7% of the respondents were willing to travel over 10 miles to use the collection

center. There was a slightly higher than expected adjusted residual value (2.2) for the 5 to 10 mile category.

Overall, the Pearson chi-square values for this data set was 33.263 with 10 degrees of freedom and a p-value of ($<.001$). The data indicates that the effect of education on HHW collection center usage is statistically significant.

P. Do these products cause pollution? * do these products cause health problems?

Due to an error in translating the written survey form to an electronic format, data was collected from only 50 of 411 survey participants. This left the study with 361 missing data points on this question with 12.2% of the data listed as valid.

Table 4.23 shows that of the 45 participants who answered "yes" to the question "Do these products cause pollution?" Thirty-five persons answered that they did believe that these products also cause health problems. Four of the respondents in this category stated that they did not believe that these products can cause health problems, and six persons responded that they did not know one way or the other. Two respondents answered that they did not believe that these products cause pollution. One of these people responded that he or she believed that the products did cause health problems, and the other responded that he or she did not believe that these products caused health problems or pollution.

The remaining three participants were not sure if these products cause pollution. Of these three persons, one thought that the products caused health problems, and two did not know if the products caused pollution or health problems.

Table 4.23 Do these household products cause pollution * do these products cause health problems

			<u>Do these products cause health problems?</u>			
			Yes	No	Don't know	Total
Do these products cause pollution?	Yes	Count	35	4	6	45
		% within cause pollution	77.8%	8.9%	13.3%	100.0%
		% within health problems	94.6%	80.0%	75.0%	90.0%
		% of total	70.0%	8.0%	12.0%	90.0%
	No	Count	1	1		2
		% within cause pollution	50.0%	50.0%		100.0%
		% within health problems	2.7%	20.0%		4.0%
		% of total	2.0%	2.0%		4.0%
	Not sure	Count	1		2	3
		% within cause pollution	33.3%		66.7%	100.0%
		% within health problems	2.7%		25.0%	6.0%
		% of total	2.0%		4.0%	6.0%
Total		Count	37	5	8	50
		% within cause pollution	74.0%	10.0%	16.0%	100.0%
		% within health problems	100.0%	100.0%	100.0%	100.0%
		% of total	74.0%	10.0%	16.0%	100.0%

IV. DATA SUMMARY

As stated in the Chapter 4, the data received from the study was gathered using a total of 15 surveyors, this method had the effect of normalizing the data, and removing surveyor bias as a possible problem with the data. The survey instrument itself was in two forms, a paper (hard copy) version and an electronic version. The questions were the same, with the exception of the one question that was lost during the transition from paper to electronic format. This hard copy format allowed those 50 surveys to be used in a limited data analysis for the question "Do you think these products cause health problems?"

Two random methods of collecting telephone numbers were used. The first method (telephone book) was used on the 50 hard copy surveys, and the last 361 were generated using a computerized random number database.

The result of the study was the successful collection of data from 411 randomly selected participants who were over eighteen years old and were currently residents of Knox County, Tennessee.

Demographic break-down of the data:

The percentage of valid data varied along with the nature of the question. Several people were unwilling to answer certain questions. The data presented is valid data only, and is presented in two parts. The first statistic represents percent of valid data collected for the question, and the second statistic represents the data collected for the question.

- Gender: Four hundred and two of four hundred eleven respondents answered the gender question for a 97.8% valid response rate. Of these valid responses, 158 (38.4%) and 252 (61.5%) were female.
- Age: Four hundred and two of 411 respondents answered the age question for a 97.8% valid response rate. The largest represented population in terms of age was the "35 to 44" age group, 21.4% of the respondents were in this group. The second and

third largest represented groups were "25 to 44" (20.1%) and 45 to 54 (18.9%) respectively.

- Education: Four hundred and nine of 411 respondents answered the education question for a 99.5% valid response rate. The majority (29.5%) of respondents in the educational attainment category reported completing "some college, with no degree." This category of attainment was followed by "high school diploma" (23.0%) and "bachelor's degree" (19.1%).
- Family income: Three hundred seventy four of 411 respondents answered the question on family income for a valid percent rate of 91.0%. Of these respondents, 38.2% reported a family income of over \$50,000.00 per year. This category of wage earners was followed by \$30,000.00. to \$49,999.00 (25.9%) and \$15,000.00 to \$29,999.00 (18.4%).
- Race: Four hundred and two of the 411 respondents agreed to answer the question of racial identity. The majority of those who agreed to participate in the study identified themselves as white (89.1%). The second most frequent group that agreed to participate in the survey identified themselves as black (5.7%). Those persons who identified themselves as Hispanic represented 1.5% of the valid responses on the survey.
- Home type: Seventy one percent of the valid respondents (99.5%) reported living in a single family home, 20.5% reported living in an apartment or duplex, and 4.4% reported living in a mobile home.
- Home ownership: 98.3% of the respondents agreed to answer the question on home ownership. Of these valid responses, 68.6% reported owning their own home and 31.4% reported renting their home.
- Public or private sewer: 92.0% of the responses on the public or private sewer question were valid. Of these valid responses, 73.3% reported using a public sewer system. Twenty six point seven percent reported using a private sewer system.
- Number of people living in the home: 96.1% of the responses to the number of people living in the home were valid. Thirty four point eight percent of the valid responses

indicated that two people lived in the home. Twenty-two point eight percent reported that one person lived in the home.

- Number of children under the age of six in the home: 99.3% of the respondents answered this question. Eighty three point three percent reported that no children under the age of six lived in the home. Nine point six percent of the respondents reported that one child under the age of six lived in the home, and 4.7% reported that two children under the age of six lived in the home.

CHAPTER 5

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

I. INTRODUCTION

The primary purpose of this study was to conduct a Household Hazardous Waste needs assessment of a sample of the population of Knox County, Tennessee.

The secondary purpose of this study was to use these findings as a basis for the development of a public educational and informational awareness program.

The study took place between January 1999 and the middle of July 1999. The study included a pilot study and the main study. The pilot study involved the telephone survey of 40 randomly selected Knox County households, and the main study involved the telephone survey of 411 Knox County households.

The study was designed to answer the following research questions.

1. What categories of hazardous materials are most commonly purchased by the general public in Knox County?
2. How much product do the respondents typically have left over?
3. How do the majority of respondents dispose of products they have left over?
4. To what extent do respondents know of the pollution problems caused by these products?
5. To what extent do the respondents know of the health problems caused by these products?
6. Are respondents aware that there is a permanent collection center for these materials in Knox County?
7. How far would respondents be willing to travel in order to properly dispose of these materials?
8. How often do the respondents think they would use a facility designed to properly dispose of these materials?

9. What are the major target groups in Knox County that are in need of specialized education or information about these materials?
10. Is there a need for a public program to educate the residents of Knox County about these issues?

II. FINDINGS

The survey results yielded the following findings. As shown in the tables in Chapter 4, the data suggests the following research questions were addressed. Each research question is addressed individually in this section of Chapter 5.

1. What categories of hazardous materials are most commonly purchased by the general public in Knox County?

Survey data suggests that the most commonly purchased hazardous products bought by residents of Knox County in the past year are household cleaners, with 91.7% of the respondent reporting having bought at least one of these products in the past year. The data suggests that the second most frequently purchased materials by Knox County residents were household batteries, with 81.1% of the respondents having reported having purchasing at least one in the past year. The third most frequently purchased products in Knox County were automotive products, and 79.8% of the respondents reported having purchased these products in the past year. Almost half (51.2%) of Knox County residents reported purchasing pesticides or related products in the past year.

While not being among the most commonly purchased products, swimming pool and photographic chemicals deserve mention due to their extremely hazardous constituents.

2. How much product do the respondents typically have left over?

Of the options for "amount of product left over," the most frequently occurring answer in all categories except batteries was "used it all." Seventy eight point six percent of the respondents reported using all of the "other" category of chemicals. This category of materials was followed by the categories of cleaners and pesticides (59.5% each). Thirty three point nine percent of the users of paint products reported using all of the product.

The most frequent quantity of materials left over was reported to be "about a quart." Thirty four point six percent of the respondents reported having a quart of cleaning agent left over. Twenty eight point nine percent reported having about a quart of paint products left over, and 22.1% of the respondents reported having about a quart of pesticides left over. Seven point one percent of the respondents reported having about a quart of chemicals left over.

Thirty six point eight percent of the respondents reported having about 1 to 5 batteries left over in the past year, 24.2% reported having 6 to 10 batteries left over in the last year, and 18.1% reported having over 20 batteries left over in the last year.

3. How do the majority of respondents dispose of products they no longer need?

The results on this research question are, for the most part, inconclusive. A large number of respondents reported that they "put the products away for later use". This answer does not address ultimate disposal, only storage for an indefinite period of time.

The most common improperly disposed of material outside of the "storage" category was the household battery category. Eighty-two point seven percent of

the respondents disposed of batteries in the garbage for regular pick up. The data indicate that for the other categories of materials, 64.6% of the respondents put excess paint away for later usage, 59.0% put excess pesticides away for later usage, 53.5% put cleaners away for later usage, and 33.5% put auto products away for later usage.

Of those persons who reported recycling the excess materials or turning them in to a HHW collection center, 31.4% reported recycling or turning in automotive products. Twenty two point two percent reported recycling or turning in "other chemicals" such as photographic and swimming pool chemicals. Sixteen point three percent reported recycling or turning in paint products. Ten point six percent reported recycling or turning in household batteries, and 8.5% reported recycling or turning in cleaners. Only 6.0% reported recycling or turning in pesticides.

4. To what extent do respondents know of the pollution problems caused by these products?

The data indicated that a large number of Knox County residents believe that some or all of these products cause pollution. Eighty six point three percent of the respondents indicated that they were aware that these products cause pollution. Five point six percent responded that these products do not cause pollution, and 8.0% reported that they did not know whether the products cause pollution or not.

5. To what extent do the respondents know of the health problems caused by these products?

A smaller percentage (74%) reported that they were aware that these products could cause health problems. Ten percent reported that these products did not cause health problems, and 16% did not know if the products could cause health problems.

6. Are respondents aware that there is a permanent collection center for these materials in Knox County?

The data collected for this study indicated that only 28.5% of the respondents were aware of an existing HHW collection center in Knox County. Twenty four point one percent of the respondents indicated that there was not a collection center in Knox County, and 47.3% did not know if there was a collection center in Knox County. This summary data indicated that 71.4% of the respondents in Knox County were not aware of the center and needed additional information on the existence and location of the center.

The data further indicated that education was not a significant indicator of awareness. No adjusted residual values for age groups indicated an unusual distribution of data. The Pearson chi square value was not significant (6.554, with 10 degrees of freedom and a p-value of .767) when education was compared to awareness.

The data indicated that home ownership was an indicator of awareness. When home owners were compared to renters, the calculations did show significance. The Pearson chi square value was 13.501 with 2 degrees of freedom and a p-value of (.001). Home ownership did increase the likelihood of collection center awareness.

The data also indicated that a person's age did have a significant effect on awareness of a collection center in Knox County. The Pearson chi square value for this cross tabulation was 18.110 with 4 degrees of freedom and a p-value of (.001). The data indicated that the age group most likely to be aware of the center consisted of those people over 55 (39.3%). Those persons between the ages of 35 and 54 were the second most likely age group to be aware of the center and only

16.1% of the respondents between the ages of 18 and 34 were aware of a collection center in Knox County.

7. How far would the respondents be willing to travel in order to properly dispose of these materials?

The data collected during the study indicated that 54.7% of the respondents were willing to travel 0 to 5 miles to properly dispose of HHW at a collection center.

Twenty eight point two percent of the respondents were willing to travel 5 to 10 miles to visit a collection center, and 9.5% were willing to travel 10 to 15 miles to visit a collection center.

The data suggested that education was significantly related to willingness to travel to visit a collection center. The Pearson chi square test results were 33.263 with 10 degrees of freedom and a p-value of less than (.001). The adjusted residual value showed unusual data distribution in the categories of "did not finish high school" and "0 to five miles" (adjusted residual 2.4) indicating that persons in this group were more likely than expected to travel this distance to visit a collection center than expected. The adjusted residual value also showed that persons with a bachelor's degree were more likely (adjusted residual 4.3) than expected to be willing to travel over 10 miles to visit a collection site.

The data suggested that home ownership was a significant factor in determining a willingness to travel to use a HHW collection center. The calculations showed this variable as significant with a Pearson chi square value of 12.168, with 3 degrees of freedom and a p-value of (.007).

The adjusted residual values showed unusual data in the renter category, with an adjusted residual value of 3.1 in the "over 15 miles" category and an adjusted residual value of -3.1 in the home owner category of over 15 miles. These results

indicate that fewer home owners than expected were willing to travel over 15 miles to use a collection site, and more renters than expected were willing to travel over 15 miles to use a collection site.

A person's age did have a significant effect on a person's willingness to travel to use a HHW collection site. The Pearson chi square value for this category was 21.203 with 6 degrees of freedom. The p-value for this statistic was calculated at (.002).

Unusual values occurred in the adjusted residual numbers of the age group 18 to 34 at a distance of 0 to 5 miles (adjusted residual -2.8) and 10 to 15 miles (adjusted residual 2.4). These values indicate that fewer people than expected in this age group were willing to travel from 0 to 5 miles to use a collection center, and that more people than expected in this age group were willing to travel 10 to 15 miles to use a HHW collection center.

Unusual adjusted residual values were also calculated for the over 55 age group, with more people than expected expressing a willingness to travel from 0 to 5 miles to use a collection center (adjusted residual 3.7), and fewer people than expected in this age group willing to travel 10 to 15 miles (adjusted residual -2.8) to use a collection center.

8. How often do the respondents think they would use a facility designed to properly dispose of these materials?

The data suggests that 41.6% of the respondents indicated that they would use a collection site "over three times per year." The second largest group (21.4%) indicated that they would use a collection site "twice a year," and the last two groups indicated that they would use the center "three times a year" (18.9%) and "one time a year" (18.1%) respectively.

The data suggested that education was not a significant factor in determining how many times a year a respondent was likely to use a collection center. The Pearson chi square value was 17.166 with 15 degrees of freedom and a p-value of (.309).

The data also suggested that home ownership was not a significant factor in determining how many times year a respondent would use a collection center. The Pearson chi square value for this cross tabulation was 4.523 with 3 degrees of freedom and a p-value of (.210).

The data suggested that age was not a significant factor in determining how many times a year a respondent would use a collection site. The Pearson chi square value for this cross tabulation was 18.914 with 15 degrees of freedom and a p-value of (.218).

9. What are the major target groups in Knox County that are in need of specialized education or information about these materials?

The survey data did suggest that two particular demographic groups were in specific need of education. Those demographic groups expressing a significant value that suggested need for addition education were those persons who rent homes (awareness of collection center), and those persons in the 18 to 34 age group (awareness of collection center).

The open-ended question format yielded a broad-based perspective on an assortment of educational needs, but these needs were not targeted to specific demographic groups.

No demographic group stood out statistically in any category other than awareness.

10. Is there a need for a public program to educate the residents of Knox County about these issues?

The data suggests that there is a need for a public program to educate the residents of Knox County Household Hazardous Waste issues. The educational program should address the following subject areas.

a. Purchasing and disposal needs:

The data collected during the survey indicates that the 81.1% of the respondents purchased batteries in the last year, and of these respondents, 82.7% disposed of the batteries improperly in the garbage.

The data indicated that 79.8% of the respondents purchased automotive products in the last year, and of these respondents, 13.4% improperly disposed of the products in the regular garbage pick up.

The data indicates that 91.7% of the respondents purchased cleaners in the last year, and of these respondents, 12.5% disposed of cleaners improperly in the regular garbage pick up.

The data indicates the need for public education on the disposal of materials in these categories.

b. Pollution problems:

The data indicate that most respondents (86.3%) were aware of potential pollution products associated with these products, but many requested additional information in the open ended question categories.

The responses to the open-ended questions lead to the conclusion that there is a desire and need among members of the general public for additional education in these categories.

c. Health problems:

The data indicate that most respondents (74%) were aware of potential health problems caused by these products. Nonetheless, 26% were not aware or were unsure if these problems were real. In addition, numerous persons asked for information about potential health problems in the open ended question portion of the survey.

The data and open-ended questions suggest the need for additional education in the health problems category.

d. Awareness of collection center:

The data indicates that fewer than 30% of Knox County residents are aware that Knox County has a collection center for Household Hazardous Waste.

These data suggest that a public health awareness program is needed to publicize the existence of the Knox County Household Hazardous Waste collection center.

III. CONCLUSIONS

1. The data showed that the most commonly bought products by residents of Knox County were: (1) household cleaners; (2) household batteries; (3) automotive products; and (4) pesticides.
2. The data showed that most Knox County residents (78.6%) most frequently used all of their products except household batteries. The most frequent quantity left over was reported to be about a quart, with the exception of the battery category.

3. Knox County residents most frequently disposed of batteries and automotive products in the regular garbage for pick up.
4. Most of Knox County residents are aware that Household Hazardous Waste can cause pollution problems.
5. Most Knox County residents are aware that Household Hazardous Waste can cause health problems.
6. Most Knox County residents are not aware that a permanent collection center exists in Knox County for the collection of Household Hazardous Waste.
7. Most residents are willing to travel from 0 to 5 miles to reach a collection center.
8. Less than half of Knox County residents would use a collection center more than three times a year.
9. Persons in the 18 to 34 age group, and non home owners are the Knox County major target groups most in need of information on the Household Hazardous Waste Collection Center in Knox County.
10. An educational awareness campaign is needed in Knox County to familiarize residents with household hazardous waste use and disposal.

IV. RECOMMENDATIONS

1. The researcher recommends that follow-up studies be conducted by interested research organizations in order to continue the needs assessment in Knox County Tennessee population and other populations nationwide.
2. The researcher recommends that a public health educational and information program be instituted in Knox County Tennessee to answer both general and specific questions posed by survey participants.

3. The researcher suggests that the information on HHW be linked to inhalant abuse, litter, environmental, and poison control information networks.

CHAPTER 6 THE EDUCATIONAL PROGRAM

I. EDUCATIONAL AWARENESS PROGRAM FOUNDATIONS

The researcher suggests the development of a public education program for the residents of Knox County based on the results of this needs assessment study. The program should be developed using the local media, guidance from the Health Belief Model, specific guidelines issued by the United States Environmental Protection Agency, and a guidance document published by the Local Hazardous Waste Management Program in King County (Washington) titled Changing Behavior: Insights and Applications (Frahm, 1995).

A. Health Belief Model; three phases:

Butler (1997) writes in Principles of Health Education, that the Health Belief Model is (HBM) "is rooted in Lewin's field theory, which conceptualizes the individual as susceptible to driving and restraining forces." He further writes that "the HBM consists of three distinct phases . . . that lead to an action related to health: individual perception, modifying factors, and likelihood of action."

1. Individual perceptions:

Phase one of this study involves individual perception. Butler (1997) writes that "individual perception is of two basic types: the individual's perception of risk of contracting the health condition, called perceived susceptibility, and perceived severity of the condition, such as disability or injury, dying, or other negative consequence."

To address the first portion of the individuals' perception of risk, a specific question was asked on the survey, "do you believe that these products cause health problems?" While most (74%) of the general public were aware that these

products cause health problems, 26% were misinformed or unsure about the relationship between these products and health problems.

The second item from the survey that addresses risk is the question; "Do you believe that these products cause pollution?" Eighty six point three percent of the respondents responded that they do believe that these products cause pollution. This difference in responses between belief that these products cause health problems and belief that these products cause pollution suggests that at least 12% of the respondents do not relate pollution to health problems.

The second portion, *phase two*, of the "individual perceptions" aspect of the health belief model is perceived severity. There are several ways to address this aspect of the Household Hazardous Waste problem. One solution would be to conduct a health promotion program that involves the delivery of information to the public in a way that:

- ties environmental problems to health problems;
- expands on the environmental issues to include human poisoning concerns;
- expands on the issues to include pet and other animal poisoning concerns;
- includes concerns about potential inhalant abuse among family members;
- and
- includes information explaining why children are more susceptible to both environmental pollution and poisoning incidents.

Frahm (1995) writes that "advertisements aiming to reduce the use of pesticides among King County residents have framed the message in terms of potential health impacts, especially on children, because market research has shown that concern about their children's health is a powerful motivator. A bus advertisement showing a child's hand reaching for a ball on a lawn, with the caption 'Child picking up a) ball, b) pesticides, c) both.' The radio and bus advertising program

appears to have had an impact. People who said they were very or somewhat likely to use bug killers or weed killers on their lawns dropped from 51% before the ad program to 38% following the program" (Northwest Research Group, 1996). This apparently successful program incorporated several messages. The program pointed out that a) bug killers and weed killers are poisons, b) children play on lawns, thus making them more susceptible to coming in contact with these poisons, and c) points out the close relationship between our children and the environment.

2. Modifying factors:

Butler (1997) writes that "modifying factors can be demographic variables such as age, gender, and educational level; sociopsychologic variables, such as personality and peer pressure; and structural variables such as knowledge about the condition or disease.

This researcher recommends focusing on the peer pressure and knowledge aspects of the HBM. In addressing the knowledge aspect of the health promotion program, the recommended approach is to use a variety of media, including the use of existing elementary school programs such as the Household Hazardous Waste Educational Program Kit. This kit is available from the San Bernardino County Department of Environmental Health Services in San Bernardino, California. For upper grades, a program such as the Hazardous Waste Education Kit may be appropriate. This kit is available from Federation of Ontario Naturalists, in Ontario, Canada.

Numerous college level courses are available, and could be incorporated into health, safety, and environmental health classes. An additional avenue of educational information dissemination should include courses in child and family services, nursing, and social work.

These educational programs contain information on HHW, and when used in a school setting, incorporate peer pressure as a method of promotion.

Outside of the education setting, a number of options exist for public health promotion activities. Knox County, for example has a public television station, and a community television station, each of which could be used for public service announcements. Knox County residents also have access to several local newspapers, radio stations, and local magazines.

A significant group of people identified through the data analysis were younger people who rent homes. This group seemed to be an excellent target group for an educational awareness program. These particular demographic groups could be reached through apartment guide magazines, sending educational brochures to local apartment management offices, and utilizing youth oriented local magazines like Metro Pulse.

One method that has been used in the past is the direct mailing of educational brochures included in Knoxville Utilities Board bills.

Other methods of disseminating information exist, including video games such as The Hazard House Computer Game, (California Department of Toxic Substances Control) that "allow students to move through a house, encounter common household products, make disposal decisions, and follow the products into the environment" and Hydrotopia, produced by the Ecology Center, Ann Arbor, Michigan.

The Internet contains a wealth of information on HHW, with sites posted by numerous universities and the Environmental Protection Agency.

3. Likelihood of action:

Butler (1997) describes the HBM's "likelihood of action" phase as being "determined by the balance or imbalance between the individual's perceived positive and negative forces affecting his or her behavior." He further quotes Dignan and Carr, (1987) as having written that: "The effectiveness of the HBM is based upon three essential factors: (1) The readiness of an individual to consider behavioral changes to avoid disease or to minimize health risks; (2) the existence and power of forces in the individual's environment that urge change and make it possible, and (3) the behaviors themselves, each of these factors is influenced by a complex set of forces that relate to the personality and environment of the individual, as well as past experiences with health services and providers."

The HHW health promotion public education program proposed for Knox County residents is designed to increase the likelihood of action by helping the residents to "acknowledge personal susceptibility," (Butler, 1997) thereby increasing the likelihood that the individuals will see the benefits of action as outweighing the barriers to action. The program will help to remove barriers preventing desired behavior primarily through education about:

- the dangerous aspects of HHW;
- how to properly dispose of HHW;
- how to properly store HHW;
- where to dispose of HHW; and
- where to get specific information about HHW.

The primary benefit the residents will receive is added protection against poisoning for their children, their pets and their families. The secondary benefits will be seen through exchange programs for paints, pesticides, and other hazardous materials.

II. THE PROGRAM

The program to educate the public about household hazardous materials will be called. Household Hazardous Materials, How to Protect your Family From the Products You Buy. The program is multifaceted. The subject matter will cover ten primary aspects of HHW purchasing, use, and disposal. The outreach program will utilize a variety of local media outlets.

A. The messages - subject matter:

The promotion's subject matter will include:

- how to dispose of household hazardous materials in Knox County;
- how to prevent your children from being poisoned by these products;
- how to purchase safer products, alternatives to toxic materials;
- how to properly store hazardous products;
- how to detect and prevent inhalant abuse in your family;
- how the improperly disposed of products cause pollution;
- how to get more information on specific products;
- where the Knox County HHW collection center is located;
- where and how to recycle use motor oil in Knox County; and
- where the Knoxville City battery recycling centers are located.

B. The media and other sources of information dispersal in Knox County, Tennessee:

Knox County has a number of outlets for information dispersal. Among these outlets are:

- classroom instruction, including elementary, junior high school, high school and college;
- bus advertisements;
- billboard advertisements;
- Channel 2, public television;

- WUOT public radio;
- commercial television (public service announcements);
- commercial radio (public service announcements);
- community television (thirty minute educational programming);
- the Knoxville News Sentinel;
- Metro Pulse;
- apartment finder magazines;
- Internet;
- direct mailings such as KUB bills;
- the use of change agents from the Department of Agriculture, the Knox County Health Department and other public agencies;
- church groups and other private agencies;
- waste container labeling; and
- direct promotion at area apartment complexes through information dispersal in apartment news letters and the rental office.

The United States Environmental Protection Agency (1993) Household Hazardous Waste Management, A Manual for One Day Collection Programs, recommends using "education through the media; information and referral services" (a telephone hotline) "mailings and mailing inserts; posters, handouts and brochures; garbage can labeling; street banners; displays/exhibits/audiovisual presentations; a speaker bureau, formal education; point of purchase information;" and "workshops and conferences" as means of getting out the message.

Some or all of these recommended methods would be beneficial if used to promote the permanent HHW collection center and proper disposal of these materials in Knox County. Information on proper labeling, use, storage, and disposal of HHW would be beneficial in preventing both chronic and acute poisoning incidents among both humans and animals in Knox County.

CHAPTER 7

THE STUDY IN RETROSPECT

I. INTRODUCTION

Early in the planning stages of this study, a decision was made to conduct the study using a telephone survey methodology. It was reasoned that this method would be efficient, cost effective, and generate reliable, valid information. It was also reasoned that allowing a person to give one on one feedback would increase their willingness to be open about their attitudes, concerns, or lack thereof. The inherent problems with mail out surveys, and the low return rates on those surveys, was considered. The bias introduced by having a group such as a classroom, or community group participate in the survey was considered. The survey targeted Knox County residents over the age of 18, and when all factors were considered, a random, telephone survey was selected as the most favorable option.

II. INSTRUMENT

The search for an established instrument (survey form) involved an extensive review of the literature. During this search, the researcher reviewed an article in the March 1997 issue of the Journal of Environmental Health, which is the official publication of the National Environmental Health Association. The article was titled Surveying Household Hazardous Waste Generation and Collection, Trends in Arizona. The study described in the article seemed to be a near perfect fit for further study in Knox County Tennessee. It was determined by the researcher and subsequently approved by the researcher's doctoral committee chairman, that the initial Arizona study could be used as a model for the Knox County study. This would allow the resulting data to be compared and add to existing information on the subject of Household Hazardous Waste (HHW). The original study had been conducted by Tyris Environmental L.C. and was partially supported by a grant from the National Institutes of Health, National Institute of Environmental Health Sciences.

After approval from the committee chairman, the next step for the researcher was to obtain permission to use the survey form developed by Tyris Environmental. The company was contacted, and approval to use the form was granted (see Appendix A) the stipulation was that the surveyors give acknowledgement to Tyris and the National Institutes of Health, National Institute of Environmental Health Sciences for development of the survey instrument.

The instrument was then presented to the researcher's doctoral committee, where the first modifications were recommended. The committee recommended two changes to the instrument. The first change was the addition of an open-ended question asking participants how the survey itself could be improved. The second change was the addition of second open-ended question asking what the survey participants would like to know more about. The open ended nature of these two additional questions resulted in the collection of in-depth insight into the needs of the community by allowing the participants to describe the type of information they were seeking in their own words,. The instrument was used in this format for the pilot study. More modifications to the instrument would follow, and the main study revealed that more modifications are still to be recommended in the evolution of the instrument.

III. PROCEDURES

Procedures were a particular problem with this study, requiring several modifications. The initial procedures were simple. The procedures required the surveyor to call the telephone numbers from a prepared list of numbers. Following procedures similar to those used in the Arizona study, a list of 2,000 potential telephone numbers was prepared using all known Knox County prefixes, with the exception of the University of Tennessee prefix of 974. This number was the only prefix that could be identified as exclusively being assigned to a business. All other known prefixes were taken from the 1998-1999 BellSouth telephone directory. These prefixes were entered into a SAS database. SAS

was then used to generate the 2,000 random numbers by assigning four random digits to each prefix on a rotational basis.

The procedures called for the surveyor to call each number a maximum of three times, or until someone answered. Businesses, non-residents of Knox County, and those persons under the age of eighteen were excluded from the survey. The telephone number system was apparently problematic to the surveyor due to the large number of FAX machines, cellular telephones and pagers that were assigned to the random numbers. The successful completed survey per phone call rate was low. The rate drastically improved when a new method of selecting numbers was developed.

During the pilot study, the surveyor was asked to use a new system of selecting numbers. This method involved using a random starting page number in the Knoxville Area telephone book, a random column number, and a random telephone number selected from that column. The successful telephone call rate increased substantially, and the method was adopted for the remainder of the pilot study.

IV. THE MAIN STUDY

The researcher underestimated the difficulties involved in conducting a telephone survey on this scale. After conducting the first 50 of 400 telephone surveys, the researcher began looking to a professional survey service to complete the task.. The study was now in its sixth month. The researcher contacted a number of agencies, and decided that the University of Tennessee's Social Science Research Institute (SSRI) was the best equipped to carry on the remainder of the project.

The SSRI employed a number of surveyors. Fifteen surveyors were eventually used on the project, and the data was logged in to an SPSS database that allowed ready development of statistical tables. These tables are illustrated Chapter 4 of this study. The

survey was conducted by SSRI using a computer generated list of telephone numbers without the apparent difficulties encountered during the pilot study.

The researcher speculated that professional telephone surveyors are not as sensitive to the wide range of responses generated during a telephone survey as non-professional surveyors. Respondents tend to be quite rude at times.

IV. LESSONS LEARNED

A number of pitfalls will be encountered by anyone attempting a telephone survey on this scale. The following problems were encountered during this study.

1. Finding persons to conduct surveys is very difficult and can be expensive. Finding people who do not experience burn-out and who will continue to conduct surveys is even more difficult.
2. Modern telephone technology is making telephone surveys even more difficult. The advent of cellular telephones, FAX machines, and pagers complicate the successful completion of calls.
3. Specific problems may be experienced when conducting surveys from one's home. The advent of Caller ID systems allows even unsuccessful telephone calls to be returned to your home telephone. Often, a person will find the surveyor's name on the Caller ID system, call back, and ask for the person listed on their Caller ID machine. The returned calls can be initially confusing for everyone, and the calls may be returned at very unexpected times.
4. Professional surveyors are expensive, but many times are worth the cost.
5. Organizational support is very difficult to find. Many government, volunteer, and community groups may express an interest in the project, but may not have the resources to assist in the endeavor.
6. People do not like to be called at home. There are numerous reasons for this, and as surveyors, you will hear numerous unhappy people voice specific concerns about being called at home.

V. CONCLUSION

- a. Despite the extensive research preceding the study, the implementation of the study itself was an exercise in trial and error. The results, however, were positive. Among the items of "new" information on the Knox County, Tennessee population, were the following.
1. The most commonly purchased group of items in the HHW arena was household cleaners (91.7%). Household batteries comprised the second most commonly purchased category of materials in the past year (81.1%).
 2. The most common answer for the method of disposal question was "put product away for later use." This answer was largely inconclusive, as there is a strong possibility that many of these persons put the products away because they did not know how to dispose of them. This method of dealing with the item does not describe the ultimate fate of the material.
 3. The most commonly identified improperly disposed of product category was household batteries, with 81.1% of the respondents stating that they put the batteries in the regular garbage for pick up.
 4. Thirty one percent of the respondents reported recycling or turning automotive products in to a HHW collection center.
 5. Most of the respondents (74%) were aware that there were potential health affects associated with HHW, and most (86.3%) were aware that there were pollution problems associated with these materials.
 6. Knox County, Tennessee hosts a permanent HHW collection center, and all City of Knoxville recycling centers have an area to recycle household batteries. Nevertheless, 71.4% were not aware of the HHW collection center.

The data indicated that level of education was not a statistically significant indicator of knowledge of the center. The data did indicate the statistical significance of both age and home ownership on knowledge of the collection

center. Homeowners were shown to be more likely to be aware of the center, and those persons in the "over 55" age group were the most likely to be aware of the center.

7. The data suggested that education does have a statistically significant influence on the distance willing to travel to a collection center, with those respondents reporting that they held a bachelor's degree the most likely group to travel over ten miles to use a collection center.

The data suggested that home ownership also had a statistically significant influence on distance willing to travel to use a collection center. The data suggested that renters are more likely to travel greater distances than homeowners to properly dispose of these materials. Those respondents in the "18 to 34" age group were the most willing to drive 10 to 15 miles to properly dispose of these materials.

A person's age was also a significant contributor to willing to travel to properly dispose of these materials.

8. The data indicated that a need does exist in Knox County to conduct a HHW Awareness Program. This data may be summed up in the following manner.
 - Eighty two point seven percent of the residents improperly disposed of household batteries, even though numerous recycling outlets exist in the city and county.
 - Seventy-nine percent of the respondents purchased automotive products in the last year, and 13.4% of these persons improperly disposed of these materials in the regular garbage.
 - Of the 91.7% of the respondents that reported purchasing cleaning products in the last year, 12.5% reported improperly disposing of these products in the regular garbage pick up.

- Many persons responded to the open ended questions on "would like to know more about . . . " A host of issues were raised, indicating a need for a public health education program.
- Fewer than thirty percent were aware that there was a HHW collection center in Knox County.

All of these variables indicate a need for a program to educate the public in Knox County about these issues. The program would be designed to target specific audiences, such as younger, non-homeowners, and also offer education to the general public on a variety of matters such as health hazards, pollution hazards, and proper disposal methods. A specific focus area would be the actual existence and location of the Household Hazardous Waste collection center and Knoxville City recycling centers.

The study identifies and lists the major sources of information used by Knox County residents to acquire information. The results of the study offer numerous insights into the issues and concerns of Knox County residents. These issues and concerns were used to form the basis for the proposed public health education program. The program is based on the Health Belief Model, and both the content and information dissemination methods are discussed at length in Chapter 6.

The Health Belief Model is based on the premise that if a person believes he or she will be affected by a health related behavior, he or she is likely to change that behavior. The proposed program would build on this premise by initially concentrating on the immediate effects of HHW. These effects should be child poisoning, inadvertent adult poisoning due to such factors as improper storage and labeling, and intentional poisoning through such actions as inhalant abuse. These potential issues have become real issues for many families. These real issues directly relate HHW to the person's immediate family, thus implementing the Health Belief Model in its most basic sense. The educational program would be an ongoing educational program, designed offer information to the

public through various media outlets such as community television, local television news, local newspapers, and apartment guide magazines.

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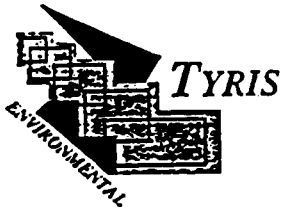
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APPENDICES

APPENDIX A



July 30, 1998

Mr. Charles "Bud" Yard
7907 West Acres Drive
Knoxville, TN 37919

Re: Use of Tyris Environmental HHW Survey

Dear Mr. ^{Bud} Yard:

This letter is to verify that you may use the HHW Survey developed by Tyris Environmental, L.C. When you use it, you'll need to reference Tyris and the grant under which we developed the survey, e.g. "The project under which this survey was developed was partially supported by grant number 1 R43 ES07677-01 from the National Institutes of Health, National Institute of Environmental Health Sciences". National Institutes of Health (NIH) requires reference to the grant number whenever the information developed under it is used.

Good luck on your project. We look forward to seeing your results. I'll put a formal, hard copy of this letter in the mail to you.

Sincerely,

Anna H. Spitz
President

P.O. Box 64514 • Tucson • Arizona • 85728
TEL 520/577/8697 • FAX 520/577/6954

APPENDIX B

ID number: _____ Date: _____

Hello, my name is _____ and I am conducting a survey for _____ County about household product use and disposal. Do you live in Maricopa County? (If not, terminate interview.)

If a child answers, say "Are you at least 18 years old?" (If no one is available 18 or over, terminate the interview.)

This will only take a few minutes and all of the information you give me is confidential. Will you participate? (If not, terminate interview.)

Product Questions

1. I am going to read a list of household products. Can you tell me which of these products you've bought in the past year?

- | | | | | |
|--|-----|----|----|----|
| A. Automotive products (such as antifreeze, batteries, motor oil, polishes and waxes, transmission and brake fluids) | Yes | No | DK | NR |
| B. Paint products (such as removers and strippers, paints, thinners, stains and finishes) | Yes | No | DK | NR |
| C. Pesticides and fertilizers | Yes | No | DK | NR |
| D. Household cleaners (such as carpet cleaner, drain openers, oven cleaner) | Yes | No | DK | NR |
| E. Miscellaneous household items (such as household batteries, hobby chemicals, pool chemicals) | Yes | No | DK | NR |

2. I see that you've bought some of the products we're concerned about today. What I'd like to find out is: what do you do with the spent, used or waste product, product you no longer need? Read the products-bought list from above. If they've said yes to automotive products, for instance, say something like: When you're finished working on your car, do you typically have any product left over? (Fill in the number of the response given.)

1. Put in the garbage can for regular pickup.
2. Taken to the landfill.
3. Poured into the backyard.
4. Poured down the sink.
5. Put away in storage for later disposal.
6. Used up completely or given to someone else to use.
7. Recycled or turned in on a household hazardous waste collection day.
8. Other
0. No Response

- _____ Automotive products
- _____ Paint products
- _____ Pesticides and fertilizers
- _____ Household cleaners
- _____ Miscellaneous items

3. When you dispose of these products, how much do you typically get rid of at a time and how many times a year do you get rid of it?

	How much?	How often?
A. Automotive products	_____	_____
B. Paint products	_____	_____
C. Pesticides/fertilizers	_____	_____
D. Household cleaners	_____	_____
E. Miscellaneous items	_____	_____
(Batteries-actual #)	_____	_____

Possible responses to How much?
Read list if necessary. Fill in number of response above.

1. About a quart (aerosol can, small canister)
2. About a gallon
3. 1-5 gallons
4. More than 5 gallons
5. Don't know
6. Other
0. No response

Possible responses to How often?
Read list if necessary. Fill in number of response above.

1. Once a year
2. Twice a year
3. Three times a year
4. More than three times a year
5. Don't know
6. Other
0. No response

4. Do you think the products that we've been talking about cause pollution?

Yes No Don't know No response

5. Do you think they cause health problems?

Yes No Don't know No response

6. Had you heard or read the phrase "household hazardous waste" (before this interview)?

Yes No Don't know No response

7. Is there a household hazardous waste collection in your community?

Yes No Don't know No response

If the response is yes, then ask:

8. Do you use the collection?

Yes No Don't know No response

Then skip to question 13.

If the response is no, then say:

9. I am going to read two possible disposal options for these household wastes. (Read 1 and 2.)

1. A collection day, held a few times a year, to bring your wastes into; or
 2. A permanent collection site, open all year round, to bring your wastes into.
- Which of these options, if any, would you be most likely to use? (circle one)

- | | |
|-------------------|----------------|
| 1. Collection Day | 5. None |
| 2. Permanent Site | 6. Don't Know |
| 3. Curbside | 0. No Response |
| 4. Other _____ | |

If the response is collection day (1), then ask:

10. How many times a year would you use a collection day? (Read list if necessary)

1. Once
2. Twice
3. Three times
4. More than three times
5. Don't know
0. No response

If the response is permanent site (2), then ask:

11. How far would you be willing to drive to use a permanent collection site?

1. Up to 5 miles
2. Up to 10 miles
3. Up to 15 miles
4. More than 15 miles
5. Don't know
0. No response

12. How many times a year do you think you would use it?

1. Once
2. Twice
3. Three times
4. More than three times
5. Don't know
0. No response

13. How do you think a safe disposal option should be funded?

1. Small charge on each item when disposed
2. Small increase in garbage collection or landfill fees
3. Tax on products when sold
4. Would not be willing to pay
5. Other _____
6. Don't know
0. No response

Statistical Questions

Finally, I would like to ask you some questions about yourself. Keep in mind that all of this is confidential and you can always say "no response." For each question, read list and circle or fill in response.

14. What kind of home do you live in?

1. Single family
2. Apartment or duplex
3. Mobile home or trailer
4. Other
5. Don't know
0. No response

15. Do you own or rent your home?

1. Own
2. Rent
0. No response

16. Do you use a public sewer or private sewer?

- 1. Public
- 2. Private
- 3. Don't know
- 0. No response

17. What is your zip code at home? _____

18. How old were you on your last birthday?

- 1. 18-24
- 2. 25-34
- 3. 35-44
- 4. 45-54
- 5. 55-65
- 6. 65 or over
- 0. No response

19. What is the highest grade in school you completed ?

- 1. Did not finish high school
- 2. High school diploma
- 3. Some college, no degree
- 4. Associate degree
- 5. Bachelor's degree
- 6. Post graduate degree
- 0. No response

20. I am going to read you some broad income groups. When I come to the one that represents your total household income, please let me know.

- 1. Under \$15,000
- 2. \$15,000-29,999
- 3. \$30,000 - \$49,999
- 4. \$50,000 or over
- 0. No response

21. How many people live in your house? _____
(actual number or N for no response)

22. Of those, how many are children under the age of 6? _____
(actual number or N for no response)

23. What is your race?

- | | |
|------------------------------------|-------------------|
| _____ White | _____ Other |
| _____ Black _____ | _____ Don't know |
| _____ Hispanic _____ | _____ No response |
| _____ American Indian/Eskimo/Aleut | |
| _____ Asian/Pacific Islander | |

24. By observation, circle one: Male Female

That is the end of our questions. Thank you very much for your time.

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APPENDIX C

Procedures for the pilot survey:

Procedures used for administering the survey instrument were designed to be as specific as possible. The equipment needed for administration of the survey included: (1) One or two telephones; (2) surveyors; (3) writing utensils; and (4) blank survey forms. The surveyors were trained in the administration of the instrument to encourage consistency, thereby increasing reliability of results.

Through an agreement with the Knox County Solid Waste Division, telephones and two surveyors were provided. The survey staff consisted of interns working for the county. The survey staff was trained to conduct the surveys using the following step by step procedure.

1. The telephone numbers were generated by the SAS software in twenty-two "blocks." Each block consisted of an equal number of telephone numbers, (there were no duplicate numbers). While it is acknowledged that each of the 94 telephone prefixes used was representative of a different number of active telephone numbers associated with that prefix, the discrepancy in the data was erased (normalized) by the procedure itself. The procedure called for each interviewer to receive eleven of the twenty-two blocks. The surveyor would call across prefixes in the following manner 207-****, 212-****, 215-****, 218-****, from his or her block of numbers until one number from each of the ninety-four prefixes on that list was called. The interviewer would then call any of the numbers that did not answer on the first round a second time, then repeat the calling across prefixes. The maximum number of times any particular number was called was three. After three calls, the interviewer marked the number on the chart as a non-response and continued down the list. With each individual calling from a separate number roster, and with no duplicate numbers existing, no numbers should have been called by both interviewers. The procedure used in the calling should have yielded a normalized percentage of successful interviews. This percentage of successful interviews should be representative of the number of active telephone numbers in each prefix zone.

2. Each survey form was labeled with an identification number. This number indicated the caller identification letter (A or B) and the form number (1 through 425). Twenty-five extra interviews were conducted to account for possible unusable completed forms or forms which were incomplete. The survey sheets should be numbered and coded before the calls begin.
3. As per the instructions printed on the survey form, the interviewer, upon successful completion of the initiating call, would state his or her name, and read the following script as closely as possible. "Hello, my name is _____, and I am conducting a survey for Knox County in association with the University of Tennessee about household product use and disposal. Do you live in Knox County?" (If not, terminate the interview).
4. If a child answers, say, "are you at least 18 years old?"
5. The interviewer then states "This will only take a few minutes, and all of the information you give me is confidential. Will you participate?" (If not, terminate the interview).
6. A third reason for terminating the interview will be if the number called belongs to a business.
7. Before asking the first question, the interviewer must read the following message.
"The project under which this survey was developed was partially supported by grant number 1 R43 ES0766-01 from the National Institutes of Health, National Institute of Environmental Health Sciences. This survey was developed by Tyrus Environmental, L.C."
8. In asking question number one, the interviewer reads a list of household products, one at a time, and asks the participant if he or she has bought the product in the last year. The acceptable answers are Yes, No, DK (don't know), and NR (no response).
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one) and adds the appropriate code for the method used to dispose of the material (1 through 0).

10. Using the same category material list utilized in questions one and two, the interviewer asked the questions of how much material is "gotten rid of" (code number cross-referencing category and amount) and how often this material is gotten rid of. The code number for frequency is entered into the field below "how often."
11. Questions 4, 5, 6, 7, and 8 are all self explanatory, are scripted and are answered with "Yes", "No", "Don't know," and "No response."
12. If the answer to question number 7 is "yes" then ask question number 8. If the answer is "no", skip to number 13. *note, Knox County has a collection center. For the purposes of this survey, this response will be a very important indicator from an educational health promotion standpoint. If a significant number of people were not aware of the center, one key to a future program in Knox County would be to promote awareness of the center.
13. Questions 8 through 12 will yield useful information on willingness and intent (attitude) towards using the site even if even for those who are unaware of its existence.
14. Questions 4 through 24 are demographic questions. After reading the script between questions 13 and 14, the interviewer needs to simply read the questions and record the answers.
15. The last part of the survey is very important, thank the participant for his or her help in the study.

A pilot study, using 10 % (40 people) of the main sample population was conducted to test the system. These data were logged in using the analyses described in the next section (IV. Data Analysis) to test the procedures and system.

After the data were collected, the information was logged into an EXCEL database. The statistical analysis was performed using SPSS software.

APPENDIX D

1	1	207-6560	59	1	673-1724	117	2	523-5726	175	2	906-0107
2	1	212-4305	60	1	675-4579	118	2	524-5483	176	2	916-3014
3	1	215-1839	61	1	687-4184	119	2	525-5485	177	2	918-8775
4	1	218-8932	62	1	688-0476	120	2	531-5354	178	2	919-1022
5	1	219-3515	63	1	689-4599	121	2	539-9306	179	2	922-2304
6	1	226-6721	64	1	690-0512	122	2	540-0981	180	2	924-0625
7	1	250-5996	65	1	691-4133	123	2	541-0451	181	2	925-4832
8	1	281-2452	66	1	693-1996	124	2	544-0902	182	2	927-7480
9	1	301-0813	67	1	694-9286	125	2	545-4950	183	2	932-1272
10	1	310-3227	68	1	701-1682	126	2	546-0755	184	2	938-0271
11	1	358-9763	69	1	719-1470	127	2	549-1542	185	2	947-8697
12	1	359-9251	70	1	769-9927	128	2	558-6763	186	2	966-3745
13	1	362-0313	71	1	777-6152	129	2	564-3267	187	2	971-6016
14	1	382-9460	72	1	805-7887	130	2	565-4600	188	2	996-4775
15	1	403-8504	73	1	806-6123	131	2	567-6359	189	3	207-7159
16	1	414-0963	74	1	809-5668	132	2	573-2817	190	3	212-5816
17	1	417-4847	75	1	810-8514	133	2	577-1938	191	3	215-3393
18	1	450-7043	76	1	818-9381	134	2	579-2321	192	3	218-6035
19	1	470-6597	77	1	850-2573	135	2	583-2225	193	3	219-4737
20	1	515-3951	78	1	873-4493	136	2	584-8182	194	3	226-5433
21	1	521-5189	79	1	904-0464	137	2	588-5918	195	3	250-8171
22	1	522-1119	80	1	905-2389	138	2	594-0232	196	3	281-3587
23	1	523-1804	81	1	906-6724	139	2	595-0719	197	3	301-5064
24	1	524-8119	82	1	916-3589	140	2	599-1434	198	3	310-2911
25	1	525-8114	83	1	918-9364	141	2	602-1648	199	3	358-3971
26	1	531-6167	84	1	919-9233	142	2	603-8344	200	3	359-2815
27	1	539-0637	85	1	922-1493	143	2	609-8665	201	3	362-3176
28	1	540-8030	86	1	924-6904	144	2	617-4744	202	3	382-9587
29	1	541-8631	87	1	925-1925	145	2	631-9996	203	3	403-7806
30	1	544-3779	88	1	927-2885	146	2	632-5770	204	3	414-7807
31	1	545-8733	89	1	932-2941	147	2	637-6474	205	3	417-0017
32	1	546-2157	90	1	938-4490	148	2	643-5961	206	3	450-0519
33	1	549-1303	91	1	947-2490	149	2	654-2681	207	3	470-5595
34	1	558-8969	92	1	966-4370	150	2	656-6165	208	3	515-3463
35	1	564-6669	93	1	971-9652	151	2	670-2281	209	3	521-0987
36	1	565-6648	94	1	996-8299	152	2	671-5903	210	3	522-2929
37	1	567-4489	95	2	207-9404	153	2	673-0160	211	3	523-9415
38	1	573-0463	96	2	212-2810	154	2	675-7068	212	3	524-5119
39	1	577-7829	97	2	215-1413	155	2	687-0353	213	3	525-2185
40	1	579-5365	98	2	218-7833	156	2	688-4555	214	3	531-4888
41	1	583-7099	99	2	219-9804	157	2	689-9450	215	3	539-6174
42	1	584-5057	100	2	226-7879	158	2	690-3347	216	3	540-4368
43	1	588-7305	101	2	250-6701	159	2	691-9999	217	3	541-4714
44	1	594-8491	102	2	281-1557	160	2	693-0957	218	3	544-2821
45	1	595-6060	103	2	301-7675	161	2	694-4811	219	3	545-0575
46	1	599-7271	104	2	310-1836	162	2	701-8266	220	3	546-6457
47	1	602-7198	105	2	358-1799	163	2	719-5203	221	3	549-8537
48	1	603-3485	106	2	359-4592	164	2	769-6329	222	3	558-4297
49	1	609-9291	107	2	362-9961	165	2	777-2861	223	3	564-8879
50	1	617-0701	108	2	382-9838	166	2	805-7018	224	3	565-7548
51	1	631-7808	109	2	403-0777	167	2	806-6205	225	3	567-9579
52	1	632-4261	110	2	414-7526	168	2	809-7477	226	3	573-0170
53	1	637-8168	111	2	417-9717	169	2	810-2618	227	3	577-8108
54	1	643-8259	112	2	450-1981	170	2	818-6822	228	3	579-4654
55	1	654-5570	113	2	470-6045	171	2	850-3460	229	3	583-8613
56	1	656-5184	114	2	515-1053	172	2	873-8551	230	3	584-0698
57	1	670-9775	115	2	521-0173	173	2	904-5613	231	3	588-9026
58	1	671-3967	116	2	522-8324	174	2	905-6798	232	3	594-5663

APPENDIX E

ID number _____ Caller ID number _____ Date _____

Hello, my name is _____ and I am conducting a survey for Knox County and the University of Tennessee about household product use and disposal. Do you live in Knox County? (If not, terminate the interview.)

If a business answers, say, "I'm sorry for the inconvenience," and terminate the interview.

If a child answers, say, "Are you at least 18 years old?" (If no one over 18 is available, terminate the interview.)

This will only take a few minutes and all of the information you give me is confidential. Will you participate? (If not, terminate the interview)

Product questions:

1. I am going to read a list of household products. Can you tell me which of these products you've bought in the past year?

- | | | | | |
|--|-----|----|----|----|
| A. Automotive products (such as antifreeze, batteries, motor oil, polishes and waxes, transmission and brake fluids) | Yes | No | DK | NR |
| B. Paint products (such as removers and strippers, paint, thinners, stains and finishes. | Yes | No | DK | NR |
| C. Pesticides and fertilizers | Yes | No | DK | NR |
| D. Household cleaners (such as carpet cleaner, drain openers, oven cleaner) | Yes | No | DK | NR |
| E. Miscellaneous household items (such as household batteries, hobby chemicals, pool chemicals) | Yes | No | DK | NR |

2. I see that you've bought some of the products we're concerned about today. What I'd like to find out is; what you do with the spent, used or waste product, product you no longer need? Read the products bought list from above. If they've said yes to automotive products, for instance, say something like; When you are finished working on your car; do you typically have any product left over? (Fill in the number of the response given.)

1. Put in the garbage for regular pick up.
2. Taken to the landfill.
3. Poured in the backyard.
4. Poured down the sink
5. Put away in storage for later disposal.
6. Used up completely or given to someone else to use.
7. Recycled or turned in on a household hazardous materials collection day.
8. Other
0. No Response

_____ Automotive products
 _____ Paint Products
 _____ Pesticides and fertilizers
 _____ Household Cleaners
 _____ Miscellaneous items

3. When you dispose of these products, how much do you typically get rid of t a time and how many times a year do you get rid of it?

	How much	How often
A. Automotive products	_____	_____
B. Paint Products	_____	_____
C. Pesticides/fertilizers	_____	_____
D. Household Cleaners	_____	_____
E. Miscellaneous items (batteries-actual number)	_____	_____

Possible responses to How much?
 Read list if necessary. Fill in number of response above.

1. About a quart (aerosol can, small canister)
2. About a gallon
3. 1-5 gallons
4. More than 5 gallons
5. Don't know
6. Other
0. No response

Possible responses to How often?
 Read list if necessary. Fill in number of response above.

1. Once a year
2. Twice a year
3. Three times a year
4. More than three time a year
5. Don't know
6. Other
0. No response

4. Do you think the products that we've been talking about cause pollution?

Yes No Don't Know No Response

5. Do you think they cause health problems?

Yes No Don't know No Response

6. Have you heard or read the phrase "Household Hazardous Waste" (before this interview?)

Yes No Don't Know No Response

7. Is there a Household Hazardous Waste collection in your community?

Yes No Don't Know No Response

(If the response is yes, then ask)

8. Do you use the collection?

Yes No Don't Know No Response

(Then skip to question number 13.)

(If the response is no, then say)

9. I am going to read two possible disposal options for these household wastes. (Read one and two)

1. A collection day, held a few times a year, to bring your wastes into; or

2. A permanent collection site, open all year round, to bring wastes into.

Which of these options, if any, would you be most likely to use? (circle one)

1. Collection day

5. None

2. Permanent site

6. Don't Know

3. Curbside

0. No Response

4. Other _____

(If the response is collection day (1) then ask:

10. How many times a year would you use a collection day? (read list if necessary)

1. Once

2. Twice

3. Three times

4. More than three times

5. Don't know

0. No response

(If the response is a permanent collection site (2) then ask:)

11. How far would you be willing to drive to use a permanent collection site?

1. Up to five miles
2. Up to 10 miles
3. Up to 15 miles
4. More than 15 miles
5. Don't Know
0. No Response

12. How many times a year do you think you would use it?

1. Once
2. Twice
3. Three times
4. More than three times
5. Don't Know
0. No Response

13. How do you think a safe disposal option should be funded?

1. Small charge on each item when disposed
2. Small increase in garbage collection or landfill fees
3. Tax on products when sold
4. Would not be willing to pay
5. Other _____
6. Don't Know
0. No Response

Statistical Questions

Finally, I would like to ask you some questions about yourself. Keep in mind that all of this is confidential and you can always say "No response." For each question, read list and circle or fill in response.

14. What kind of home do you live in?

1. Single family
2. Apartment or duplex
3. Mobile home or trailer
4. Other
5. Don't know
0. No Response

15. Do you rent or own your home?

1. Own
2. Rent
0. No Response

16. Do you use a public sewer or private sewer?

- 1. Public
- 2. Private
- 3. Don't Know
- 0. No Response

17. What is your zip code at home? _____

18. How old were you on your last birthday?

- 1. 18-24
- 2. 25-34
- 3. 35-44
- 4. 45-54
- 5. 55-65
- 6. 65 or over
- 0. No response

19. What is the highest grade in school you completed?

- 1. Did not finish high school
- 2. High School diploma
- 3. Some college, no degree
- 4. Associate degree
- 5. Bachelor's degree
- 6. Post graduate degree
- 0. No response

20. I am going to read you some income groups. When I come to the one that represents your total household income, please let me know.

- 1. Under \$15,000.
- 2. \$15,000. to \$29,900.
- 3. \$30,000. to \$49,900.
- 4. \$50,000. Or over
- 0. No Response

21. How many people live in your house? _____?
(Actual number or N for No Response)

22. Of those, how many are under the age of 6? _____?
(Actual number or N for No Response)

23. What is your race?

- | | |
|-------------------------------------|-------------------|
| _____ White | _____ Other |
| _____ Black | _____ Don't Know |
| _____ Hispanic | _____ No Response |
| _____ American Indian/Eskimo Indian | |
| _____ Asian/Pacific Islander | |

24. By observation, circle one: Male Female

24. How do you think this survey can be improved?

25. What Household Hazardous Materials issues would you like to know more about?

That is the end of our questions.

"The project under which this survey was developed was partially supported by grant number 1 R43 ES0766-01 from the National Institutes of Health, Institute of Environmental Health Sciences. This survey was developed by Tyris Environemtnal, L.C."

Thank you very much for your time.

APPENDIX F

Instructions for using Household Hazardous Waste survey form

1. Use a separate note pad to record telephone numbers and results. This pad should have the following format. Please log all calls.

Telephone number

Call result

000-0000	No answer "NA"	Successful "S"	Business "B"	Ineligible "I"	Chose not to respond "R"
----------	-------------------	-------------------	-----------------	-------------------	-----------------------------

000-0000	NA				
111-1111			B		
222-2222					R
333-3333		S			

1. Enter your assigned ID number into space # 2 "Surveyor ID number."
2. Enter date in space # 3 "Date."
3. Take 1998-1999 telephone book and find the assigned random page number.
4. Find the assigned random column number.
5. Count down the list of telephone numbers in that column until you reach the assigned random telephone number.
6. Call that number.
7. Read first paragraph; include your first name only in space. Tell the respondent that the survey will only take three to four minutes.
8. Ask if the number is a business number. If a business answers, apologize and hang up.
9. Ask if the person is a Knox County resident. If he or she is not a Knox County resident, apologize and hang up.
10. Ask if the person is at least 18 years old. If the person is under 18, Apologize and hand up.
11. Read question 1. The categories for sub questions a and b "how much" and "how disposed" are located on the back of last page of the survey. To access these category lists, fold the second page of the survey back. The back page is printed up side down, and for convenience, will appear right side up using this method.
12. Use the first category list on the last page of the survey if the person has questions about what the category means (miscellaneous) for example.
13. Using the second category list on the last page of the survey, enter the code for "how much." The code will be 1, 2, 3, 4, 5, or 6.
14. Using the second category list on the last page of the survey, enter the code for "how disposed." The code will be 1, 2, 3, 4, 5 or 6.
15. Read question 2, check the box with the appropriate answer.
16. Read questions 3 through 13, check the appropriate answers.
17. Ask question number 14, enter zip code.

18. Read questions 15 through 21, check the appropriate answers.
19. Fill in answers for questions 22 and 23.
20. Measure 10 inches down the list of telephone numbers, (measure only that portion of the book that contains the telephone numbers). In other words, do not include the margins at the top or the bottom of the page in the measurements.
21. Call that number and repeat the process. Between each number, measure the appropriate 10 inches.
22. Skip the following portions of the telephone book; government pages, business pages and Maynardville.

APPENDIX G

Procedures:

Procedures used for administering the survey instrument were designed to be as specific as possible. The equipment needed for administration of the survey included: (1) One or two telephones; (2) surveyors; (3) writing utensils; and (4) blank survey forms. The surveyors were trained in the administration of the instrument to encourage consistency, thereby increasing reliability of results.

Through an agreement with the Knox County Solid Waste Division, telephones and two surveyors were provided. The survey staff consisted of interns working for the county. The survey staff was trained to conduct the surveys using the following step by step procedure.

1. The telephone numbers were generated by the SAS software in twenty-two "blocks." Each block consisted of an equal number of telephone numbers, (there were no duplicate numbers). While it is acknowledged that each of the 94 telephone prefixes used was representative of a different number of active telephone numbers associated with that prefix, the discrepancy in the data was erased (normalized) by the procedure itself. The procedure called for each interviewer to receive eleven of the twenty-two blocks. The surveyor would call across prefixes in the following manner 207-****, 212-****, 215-****, 218-****, from his or her block of numbers until one number from each of the ninety-four prefixes on that list was called. The interviewer would then call any of the numbers that did not answer on the first round a second time, then repeat the calling across prefixes. The maximum number of times any particular number was called was three. After three calls, the interviewer marked the number on the chart as a non-response and continued down the list. With each individual calling from a separate number roster, and with no duplicate numbers existing, no numbers should have been called by both interviewers. The procedure used in the calling should have yielded a normalized percentage of successful interviews. This percentage of successful interviews should be representative of the number of active telephone numbers in each prefix zone.

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3. As per the instructions printed on the survey form, the interviewer, upon successful completion of the initiating call, would state his or her name, and read the following script as closely as possible. "Hello, my name is _____, and I am conducting a survey for Knox County in association with the University of Tennessee about household product use and disposal. Do you live in Knox County?" (If not, terminate the interview).
4. If a child answers, say, "are you at least 18 years old?"
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7. Before asking the first question, the interviewer must read the following message.
"The project under which this survey was developed was partially supported by grant number 1 R43 ES0766-01 from the National Institutes of Health, National Institute of Environmental Health Sciences. This survey was developed by Tyrus Environmental, L.C."
8. In asking question number one, the interviewer reads a list of household products, one at a time, and asks the participant if he or she has bought the product in the last year. The acceptable answers are Yes, No, DK (don't know), and NR (no response).
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one) and adds the appropriate code for the method used to dispose of the material (1 through 0).

10. Using the same category material list utilized in questions one and two, the interviewer asked the questions of how much material is "gotten rid of" (code number cross-referencing category and amount) and how often this material is gotten rid of. The code number for frequency is entered into the field below "how often."
11. Questions 4, 5, 6, 7, and 8 are all self explanatory, are scripted and are answered with "Yes", "No", "Don't know," and "No response."
12. If the answer to question number 7 is "yes" than ask question number 8. If the answer is "no", skip to number 13. *note, Knox County has a collection center. For the purposes of this survey, this response will be a very important indicator from an educational health promotion standpoint. If a significant number of people were not aware of the center, one key to a future program in Knox County would be to promote awareness of the center.
13. Questions 8 through 12 will yield useful information on willingness and intent (attitude) towards using the site even if even for those who are unaware of its existence.
14. Questions 4 through 24 are demographic questions. After reading the script between questions 13 and 14, the interviewer needs to simply read the questions and record the answers.
15. The last part of the survey is very important, thank the participant for his or her help in the study.

A pilot study, using 10 % (40 people) of the main sample population was conducted to test the system. These data were logged in using the analyses described in the next section (IV. Data Analysis), to test the procedures and system.

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APPENDIX H

q:knoxres

Q:RESPSEX

1 MALE

2 FEMALE

q:autoprod

Automotive products such as antifreeze, batteries, motor oil, polish and wax, transmission fluids, and brake fluids?

1 YES

2 NO

8 DON'T KNOW

9 MISSING/REFUSED

q:autoleft

How much did you have left over?

1 ABOUT A QUART

2 ABOUT A GALLON

3 1 - 5 GALLONS

4 MORE THAN 5 GALLONS

5 DID NOT HAVE ANY LEFT OVER - USED IT ALL

8 DON'T KNOW

9 MISSING/REFUSED

q:autodisp

How did you dispose of the leftover product?

1 PUT IN GARBAGE FOR REGULAR PICKUP

2 TAKE TO THE LANDFILL

3 POUR IN THE BACK YARD

4 POUR DOWN THE SINK

5 PUT AWAY FOR LATER USE AND/OR DISPOSAL

6 GAVE TO SOMEONE ELSE

7 RECYCLED OR TURNED IN ON A HOUSEHOLD HAZARDOUS WASTE
COLLECTION DAY

8 OTHER

9 MISSING

Q:PAINT

Did your household purchase any paint products such as paint, paint remover, strippers, stains, and finishes?

1 YES

2 NO

8 DON'T KNOW

9 MISSING/REFUSED

q:paintlft

How much did you have left over?

- 1 ABOUT A QUART
- 2 ABOUT A GALLON
- 3 1 - 5 GALLONS
- 4 MORE THAN 5 GALLONS
- 5 DID NOT HAVE ANY LEFT OVER - USED IT ALL
- 8 DON'T KNOW
- 9 MISSING/REFUSED

q:paintdis

How did you dispose of the leftover product?

- 1 PUT IN GARBAGE FOR REGULAR PICKUP
- 2 TAKE TO THE LANDFILL
- 3 POUR IN THE BACK YARD
- 4 POUR DOWN THE SINK
- 5 PUT AWAY FOR LATER USE AND/OR DISPOSAL
- 6 GAVE TO SOMEONE ELSE
- 7 RECYCLED OR TURNED IN ON A HOUSEHOLD HAZARDOUS WASTE
COLLECTION DAY
- 8 OTHER
- 9 MISSING

q:pest

Did your household purchase any pesticides or fertilizers?

- 1 YES
- 2 NO
- 8 DON'T KNOW
- 9 MISSING/REFUSED

Q:PESTLEFT

How much did you have left over?

- 1 ABOUT A QUART
- 2 ABOUT A GALLON
- 3 1 - 5 GALLONS
- 4 MORE THAN 5 GALLONS
- 5 DID NOT HAVE ANY LEFT OVER - USED IT ALL
- 8 DON'T KNOW
- 9 MISSING/REFUSED

q:pestdisp

How did you dispose of the leftover product?

- 1 PUT IN GARBAGE FOR REGULAR PICKUP
- 2 TAKE TO THE LANDFILL
- 3 POUR IN THE BACK YARD
- 4 POUR DOWN THE SINK
- 5 PUT AWAY FOR LATER USE AND/OR DISPOSAL
- 6 GAVE TO SOMEONE ELSE
- 7 RECYCLED OR TURNED IN ON A HOUSEHOLD HAZARDOUS WASTE
COLLECTION DAY
- 8 OTHER
- 9 MISSING

q:cleaner

Did your household purchase any household cleaners such as carpet cleaner, drain opener, oven cleaner, or bathroom cleaner?

- 1 YES
- 2 NO
- 8 DON'T KNOW
- 9 MISSING/REFUSED

q:cleanlft

How much did you have left over?

- 1 ABOUT A QUART
- 2 ABOUT A GALLON
- 3 1- 5 GALLONS
- 4 MORE THAN 5 GALLONS
- 5 DID NOT HAVE ANY LEFT OVER - USED IT ALL
- 8 DON'T KNOW
- 9 MISSING/REFUSED

q:cleandis

How did you dispose of the leftover product?

- 1 PUT IN GARBAGE FOR REGULAR PICKUP
- 2 TAKE TO THE LANDFILL
- 3 POUR IN THE BACK YARD
- 4 POUR DOWN THE SINK
- 5 PUT AWAY FOR LATER USE AND/OR DISPOSAL
- 6 GAVE TO SOMEONE ELSE
- 7 RECYCLED OR TURNED IN ON A HOUSEHOLD HAZARDOUS WASTE
COLLECTION DAY
- 8 OTHER
- 9 MISSING

q:battery

Did your household purchase any household batteries?

- 1 YES
- 2 NO
- 8 DON'T KNOW
- 9 MISSING/REFUSED

q:BATTLEFT

How many did you dispose of?

- 1 1-5
- 2 6-10
- 3 11-15
- 4 16-20
- 5 over 20
- 6 HAVE NOT DISPOSED OF ANY - STILL USING ORIGINAL BATTERIES
- 8 DON'T KNOW
- 9 MISSING/REFUSED

q:battdisp

How did you dispose of the leftover batteries?

- 1 PUT IN GARBAGE FOR REGULAR PICKUP
- 2 TAKE TO THE LANDFILL
- 3 THREW IN THE BACK YARD
- 7 RECYCLED OR TURNED IN ON A HOUSEHOLD HAZARDOUS WASTE COLLECTION DAY
- 8 OTHER
- 9 MISSING

q:misc

Did your household purchase any other household items such as hobby chemicals such as photographic chemicals, or swimming pool chemicals?

- 1 YES
- 2 NO
- 8 DON'T KNOW
- 9 MISSING

q:miscleft

How much did you have left over?

- 1 ABOUT A QUART
- 2 ABOUT A GALLON
- 3 1 - 5 GALLONS
- 4 MORE THAN 5 GALLONS
- 5 DID NOT HAVE ANY LEFT OVER -USED IT ALL
- 8 DON'T KNOW
- 9 MISSING/REFUSED

q:miscdisp

How did you dispose of the leftover product?

- 1 PUT IN GARBAGE FOR REGULAR PICKUP
- 2 TAKE TO THE LANDFILL
- 3 POUR IN THE BACK YARD
- 4 POUR DOWN THE SINK
- 5 PUT AWAY FOR LATER USE AND/OR DISPOSAL
- 6 GAVE TO SOMEONE ELSE
- 7 RECYCLED OR TURNED IN ON A HOUSEHOLD HAZARDOUS WASTE COLLECTION DAY
- 8 OTHER
- 9 MISSING

q:pollute

Do you think these products cause pollution?

- 1 YES
- 2 NO
- 8 NOT SURE
- 9 MISSING/REFUSED

Q:HRDPHRAS

Have you heard or read the phrase "Household Hazardous Waste" before this interview?

- 1 YES
- 2 NO
- 8 NOT SURE
- 9 MISSING/REFUSED

Q:comcentr

Is there a Household Hazardous Waste collection center in your community?

- 1 YES
- 2 NO
- 8 NOT SURE
- 9 MISSING/REFUSED

Q:dispopt

Of the following disposal options, which one would you most likely use?

- 1 COLLECTION DAY
- 2 PERMANENT SITE
- 3 CURBSIDE
- 4 NONE
- 5 OTHER
- 8 DON'T KNOW
- 9 MISSING/REFUSED

Q:COLLFREQ

If you used the collection day, how many times a year would you use it?

- 1 ONCE
- 2 TWICE
- 3 THREE TIMES
- 4 MORE THAN THREE
- 8 DON'T KNOW
- 9 MISSING/REFUSED

Q:SITEDIST

How far would you be willing to drive to use a permanent collection site?

- 1 0-5 MILES
- 2 5-10 MILES
- 3 10-15 MILES
- 4 OVER 15 MILES
- 8 DON'T KNOW
- 9 MISSING/REFUSED

Q:SITEFREQ

How many times a year do you think you would use a collection site?

- 1 ONCE
- 2 TWICE
- 3 THREE TIMES
- 4 OVER THREE TIMES
- 8 DON'T KNOW
- 9 MISSING/REFUSED

Q:HOMETYPE

What kind of home do you live in?

- 1 SINGLE FAMILY
- 2 MOBILE HOME
- 3 APARTMENT OR DUPLEX
- 4 OTHER
- 8 DON'T KNOW
- 9 MISSING/REFUSED

q:ownhome

Do you rent or own your home?

- 1 RENT
- 2 OWN
- 9 MISSING/REFUSED

Q:sewer

Do you use a public or private sewer, such as a septic tank?

- 1 PUBLIC
- 2 PRIVATE
- 8 DON'T KNOW
- 9 MISSING/REFUSED

Q:ZIPCODE

What is your zip code at home?

[USE 99999 FOR NOT SURE OR REFUSAL]

Q:age

How old were you on your last birthday?

- 1 18-24
- 2 25-34
- 3 35-44
- 4 45-54
- 5 55-65
- 6 65 and over
- 9 Missing/Refused

Q:educ

Which category best represents your education?

- 1 DID NOT FINISH HIGH SCHOOL
- 2 HIGH SCHOOL DIPLOMA
- 3 SOME COLLEGE, NO DEGREE
- 4 ASSOCIATE DEGREE
- 5 BACHELOR'S DEGREE
- 6 POST GRADUATE DEGREE
- 9 MISSING/REFUSED

Q:INCOME

What category best represents your annual family income?

- 1 LESS THAN \$15,000
- 2 \$15,000 - \$29,999
- 3 \$30,000 - \$49,999
- 4 \$50,000 OR ABOVE
- 8 NOT SURE
- 9 MISSING/REFUSED

Q:HHNUMBER

How many people live in your house?[USE 99 FOR MISSING/REFUSED]

Q:undersix

How many are under the age of 6?[USE 99 FOR MISSING/REFUSED]

Q:race

What is your race?

- 1 AMERICAN INDIAN/ESKIMO
- 2 ASIAN / PACIFIC ISLANDER
- 3 BLACK
- 4 HISPANIC6 OTHER
- 5 WHITE
- 6 OTHER
- 8 DON'T KNOW
- 9 MISSING/REFUSED

Q:callerid

ENTER YOUR CALLER ID

APPENDIX I

ID number _____ Caller ID number _____ Date _____

Hello, my name is _____ and I am conducting a survey for Knox County Solid Waste Division and the University of Tennessee about household product use and disposal. Do you live in Knox County? (If not, terminate the interview.)

If a business answers, say, "I'm sorry for the inconvenience," and terminate the interview.

If a child answers, say, "Are you at least 18 years old?" (If no one over 18 is available, terminate the interview.)

This will only take a few minutes and all of the information you give me is confidential. Will you participate? (If not, terminate the interview)

Product questions:

1. I am going to read a list of household products. Can you tell me which of these products you've bought in the past year?

- | | | | | |
|--|-----|----|----|----|
| A. Automotive products (such as antifreeze, batteries, motor oil, polishes and waxes, transmission and brake fluids) | Yes | No | DK | NR |
| B. Paint products (such as removers and strippers, paint, thinners, stains and finishes. | Yes | No | DK | NR |
| C. Pesticides and fertilizers | Yes | No | DK | NR |
| D. Household cleaners (such as carpet cleaner, drain openers, oven cleaner) | Yes | No | DK | NR |
| E. Miscellaneous household items (such as household batteries, hobby chemicals, pool chemicals) | Yes | No | DK | NR |

2. I see that you've bought some of the products we're concerned about today. What I'd like to find out is; what you do with the spent, used or waste product, product you no longer need? Read the products bought list from above. If they've said yes to automotive products, for instance, say something like; When you are finished working on your car; do you typically have any product left over, such as used motor oil? (Fill in the number of the response given.)

1. Put in the garbage for regular pick up.
2. Taken to the landfill.
3. Poured in the backyard.
4. Poured down the sink
5. Put away in storage for later disposal.
6. Used up completely or given to someone else to use.
7. Recycled or turned in on a household hazardous materials collection day.
8. Other
0. No Response

_____ Automotive products
 _____ Paint Products
 _____ Pesticides and fertilizers
 _____ Household Cleaners
 _____ Miscellaneous items

3. When you dispose of these products, how much do you typically get rid of at a time and how many times a year do you get rid of it?

	How much	How often
A. Automotive products	_____	_____
B. Paint Products	_____	_____
C. Pesticides/fertilizers	_____	_____
D. Household Cleaners	_____	_____
E. Miscellaneous items	_____	_____
(batteries-actual number)		

Possible responses to **How much?**
Read list if necessary. Fill in number of response above.

1. About a quart (aerosol can, small canister)
2. About a gallon
3. 1-5 gallons
4. More than 5 gallons
5. Don't know
6. Other
0. No response

Possible responses to **How often?**
Read list if necessary. Fill in number of response above.

1. Once a year
2. Twice a year
3. Three times a year
4. More than three times a year
5. Don't know
6. Other
0. No response

4. Do you think the products that we've been talking about cause pollution?

Yes No Don't Know No Response

5. Do you think they cause health problems?

Yes No Don't know No Response

6. Have you heard or read the phrase "Household Hazardous Waste" (before this interview?)

Yes No Don't Know No Response

7. Is there a Household Hazardous Waste collection in your community?

Yes No Don't Know No Response

(If the response is yes, then ask)

8. Do you use the collection?

Yes No Don't Know No Response

9. Of the following disposal options for household hazardous waste, which would you be most likely to use? (circle one)

- | | |
|-------------------|----------------|
| 1. Collection day | 5. None |
| 2. Permanent site | 6. Don't Know |
| 3. Curbside | 0. No Response |
| 4. Other _____ | |

(If the response is **collection day** (1) then ask:

10. How many times a year would you use a collection day? (read list if necessary)

1. Once
2. Twice
3. Three times
4. More than three times
5. Don't know
0. No response

(If the response is a **permanent collection site** (2) then ask:)

11. How far would you be willing to drive to use a permanent collection site?

1. Up to five miles
2. Up to ten miles
3. Up to fifteen miles
4. More than fifteen miles
5. Don't Know
0. No Response

12. How many times a year do you think you would use it?

1. Once
2. Twice
3. Three times
4. More than three times
5. Don't Know
0. No Response

13. How do you think a safe disposal option should be funded?

1. Small charge on each item when disposed
2. Small increase in garbage collection or landfill fees
3. Tax on products when sold
4. Would not be willing to pay
5. Other _____
6. Don't Know
0. No Response

Statistical Questions

Finally, I would like to ask you some questions about yourself. Keep in mind that all of this is confidential and you can always say "No response." For each question, read list and circle or fill in response.

14. What kind of home do you live in?

1. Single family
2. Apartment or duplex
3. Mobile home or trailer
4. Other
5. Don't know
0. No Response

15. Do you rent or own your home?

1. Own
2. Rent
0. No Response

16. Do you use a public sewer or private sewer?

1. Public
2. Private
3. Don't Know
0. No Response

17. What is your zip code at home? _____

18. How old were you on your last birthday?

1. 18-24
2. 25-34
3. 35-44
4. 45-54
5. 55-65
6. 65 or over
0. No response

19. What is the highest grade in school you completed?

1. Did not finish high school
2. High school diploma
3. Some college, no degree
4. Associate degree
5. Bachelor's degree
6. Post graduate degree
0. No response

20. I am going to read you some income groups. When I come to the one that represents your total household income, please let me know.

1. Under \$15,000.
2. \$15,000. to \$29,900
3. \$30,000. to \$49,900.
4. \$50,000. or over
0. No Response

Figure 4A

21. How many people live in your house? _____?
(Actual number or NR for No Response)

22. Of those, how many are under the age of 6? _____?
(Actual number or NR for No Response)

23. What is your race?

- | | |
|----------------------------------|----------------|
| 1. American Indian/Eskimo Indian | 6. Other |
| 2. Asian/Pacific Islander | 7. Don't know |
| 3. Black | 0. No response |
| 4. Hispanic | |
| 5. White | |

24. By observation, circle one: Male Female

25. How do you think this survey can be improved?

26. What Household Hazardous Materials issues would you like to know more about?

That is the end of our questions.

“The project under which this survey was developed was partially supported by grant number 1 R43 ES0766-01 from the National Institutes of Health, Institute of Environmental Health Sciences. This survey was developed by Tyris Environmental, L.C.”

Thank you very much for your time.

APPENDIX J

DEMOGRAPHIC RESULTS:

The study design included all demographic data that the researcher considered pertinent to the study. This demographic data collected for this study includes categories for gender, home type, home ownership, public or private sewer systems, age, education, income, number of people living in the house, number of children under six, family income, and race.

a. Gender:

Table 4.24 "respondent's gender" shows that the study consisted of 38.4% male respondents and 61.5% female respondents. These persons were chosen at random so the ratio of males to females occurred completely by chance. Nine data points were missing, these missing data points can only be attributable to surveyor error.

Table 4.24 Respondent's Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	158	38.4	38.5	38.5
	Female	252	61.3	61.5	100.0
	Total	410	99.8	100.0	
Missing	9	1	.2		
Total	411	100.0			

b. Age:

Table 4.25 "respondent's age" illustrates the ages of study participants. The ages are represented in groupings. The minimum age of participation was age 18, so the youngest category was the 18 to 24 age group. Nine point two percent of the valid respondents were in this youngest age group. Twenty point one percent of the respondents were in the 25 to 34 age group. The largest represented age group was 35 to 44. Twenty-one point four of the valid responses were in this group. The 45 to 54 age group represented 18.9 percent of the valid responses, the 55 to 64 age group was represented by 12.9% of the respondents and 17.4% of the valid responses were in the 65 and older age group.

Table 4.25 Respondent's age

	Age	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-24	37	9.0	9.2	9.2
	25-34	81	19.7	20.1	29.4
	35-44	86	20.9	21.4	50.7
	45-54	76	18.5	18.9	69.7
	55-64	52	12.7	12.9	82.6
	65 and over	70	17.0	17.4	100.0
	Total	402	97.8	100.0	
Missing	9	9	2.2		
Total		411	100.0		

c. Education:

Most respondents, (98.6%) agreed to categorize their educational attainment. This success rate resulted in 409 valid data points for table 4.26 "respondent's educational attainment level." Of the 409 valid responses, 12.2 percent reported that they had successfully completed a post graduate college degree. Nineteen point one percent reported that they had successfully completed a bachelor's degree program and 6.7% of the respondents reported that they had completed an associate degree. Twenty-nine point three of the respondents reported that they had attended college, but had not completed a degree, 23.0% reported that they had completed high school, and 9.5% reported that they had not completed high school. Nine data points were missing.

Table 4.26 Respondent's educational attainment level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not finish high school	39	9.5	9.5	9.5
	High school diploma	94	22.9	23.0	32.5
	Some college, no degree	120	29.2	29.3	61.9
	Associate degree	28	6.8	6.8	68.7
	Bachelor's degree	78	19.0	19.1	87.8
	Post graduate degree	50	12.2	12.2	100.0
Missing	Refused,/ missing	2	.5		
Total		411	100.0		

d. Family income:

A number of respondents did not wish to reveal their income classification but table 4.27 "respondent's annual family income" illustrates the distribution of those that agreed to provide this information. Three hundred seventy four of the respondents did provide their income classification, and of these valid data, 38.3% reported their family income to be 50,000 dollars or more per year. Twenty five point nine reported their income at 30,000 to 49,900, 18.4% of the study participants reported a family income of 15,000 to 29,999 dollars per year, and 17.4% of the respondents reported an income of less than 15,000 dollars per year. Forty one data points were missing.

Table 4.27 Respondent's annual family income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than \$15,000.	65	15.8	17.4	17.4
	\$15,000. - \$29,999.	69	16.8	18.4	35.8
	\$30,000. - \$49,999.	97	23.6	25.9	61.8
	\$50,000. or above	143	34.8	38.2	100.0
	Total	374	91.0	100.0	
Missing	Not sure	12	2.9		
	Missing / refused	25	6.1		
	Total	37	9.0		
Total		411	100.0		

e. Race:

Table 4.28 "Respondent's race" illustrates that 1.0% of the valid respondents were in the "American Indian/Eskimo" race category, 1.0% of the valid respondents were in the "Asian/Pacific Islander" race category, and the second largest group consisted of black respondents. These groups represented 5.6% of the valid responses. Hispanics consisted of 1.7% of the valid responses. The largest group of respondents was white. 89.1% of the respondents were in this race category. One point five percent of the respondents were classified as "other."

Table 4.28 Respondent's race

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian / Eskimo Indian	4	1.0	1.0	1.0
	Asian / Pacific Islander	4	1.0	1.0	2.0
	Black	23	5.6	5.7	7.7
	Hispanic	7	1.7	1.7	9.5
	White	358	87.1	89.1	98.5
	Other	6	1.5	1.5	100.0
	Total	402	97.8	100.0	
Missing	Don't know	3	.7		
	Missing / refused	6	1.5		
	Total	9	2.2		
Total		411	100.0		

f. Home type:

Table 4.29 "respondent's home type" shows that the categories of "type of home" consisted of "single family, mobile home, apartment or duplex, and other." The table shows that 71.0% of the respondents reported living in a single family home, 4.4% reported living in a mobile home, 20.4% reported living in an apartment or duplex and 3.6% reported living in "other" types of homes.

Table 4.29 Respondent's home type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single family	292	71.0	71.4	71.4
	Mobile home	18	4.4	4.4	75.8
	Apartment or duplex	84	20.4	20.5	96.3
	Other	15	3.6	3.7	100.0
	Total	409	99.5	100.0	
Missing	Missing / refused	2	.5		
Total		411	100.0		

g. Home ownership:

Table 4.30 "rent or own home" shows that the study recorded 404 valid responses from 411 respondents, for a valid response percentage of 98.3%. Of these respondents, 31.4% reported that they rented their homes and 6.6% of the respondents reported that they own their homes. There were seven missing data points.

Table 4.30 Rent or own home

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rent	127	30.9	31.4	31.4
	Own	277	67.4	68.6	100.0
	Total	404	98.3	100.0	
Missing	Refused / missing	7	1.7		
Total		411	100.0		

h. Public or private sewer:

Table 4.31 "public or private sewer system" shows that 277 valid responses were received from 411 respondents. Of these valid responses, 73.3% reported using a public sewer system, and 26.7% reported using a private system. Those data that were recorded as missing included those responses from persons who did not know which type of system they were on, or were categorized as missing/refused to answer. Of these invalid responses, 29 (or 7.1%) did not know what type of system they were on and 4 were recorded as missing/refused to answer.

Table 4.31 Public or private sewer system

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Public	277	67.4	73.3	73.4
	Private	101	24.6	26.7	100.0
	Total	378	92.0	100.0	
Missing	Don't know	29	7.1		
	Missing / refused	4	1.0		
	Total	33	8.0		
Total		411	100.0		

i. Number of people living in the home:

Table 4.32 "Number of people living in the home" shows that 408 valid responses were received from 411 persons. When asked "how many people live in your home," 22.6% responded that they were the only person living in the home, 34.8% responded that there were two people living in the home, 17.9 people responded that there were three people living in the home, 15.0% responded that there were four people living in the home, 5.9% responded that there were five people living in the home and 3.6% responded that there were six people or more living in the home. One valid respondent reported that 25 people lived in the home. This "home" was described as a fraternity house.

Table 4.32 Number of people living in the home

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	93	22.6	22.8	22.8
	2	142	34.5	34.8	57.6
	3	73	17.8	17.9	75.5
	4	61	14.8	15.0	90.4
	5	24	5.8	5.9	96.3
	6	4	1.0	1.0	97.3
	7	2	1.0	1.0	98.3
	8	2	.5	.5	98.8
	9	3	.7	.7	99.5
	25	1	.2	.2	99.8
	60	1	.2	.2	100.0
	Total	408	99.3	100.0	
Missing	99	3	.7		
Total		411	100.0		

j. Number of children living in the home under six:

Table 4.33 "number of children living in the home under the age of six" illustrates that 408 of 411 responses received were valid. Of these valid responses, 83.3% reported that there were no children living in the home. 9.6% of the respondents reported that there was one child under six in the home. 4.7% of the valid respondents reported that there were two children under six in the home, and 2.0% reported that there were more than three children under six living in the home.

Table 4.33 Number of children living in the home under the age of six"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	342	83.2	83.8	83.8
	1	39	9.5	9.6	93.4
	2	19	4.6	4.7	98.0
	3	4	1.0	1.0	99.0
	4	2	.5	.5	99.5
	9	2	.5	.5	100.0
	Total	408	99.3	100.0	
Missing	99	2	.5		
	System	1	.2		
	Total	3	.7		
Total		411	100.0		

APPENDIX K

Open ended question number one: How do you think this survey can be improved?

The survey participants offered a wide range of responses on the question ""How do you think this survey can be improved?" One hundred sixty one of the respondents replied that they had "no suggestions," "thought it was a good survey," and other non specific responses. A number of others, however, did offer specific comments on the survey and how it was conducted. The data recorded in this section is divided in the following three sections; surveyor improvements, survey improvements, methodology improvements, questions people thought were offensive, and general comments.

1. Surveyor improvements:

- I don't know, slow down a little bit. Down here in the south we talk kind of slow;
- A little bit gentler;
- Talk slower;
- Speak better and slower;
- Attitude is important;
- Explain things a little better
- Yeah, batteries in gallons?

2. Survey improvements:

- They need a place for comments. For example, they need more than one site on Baxter Avenue, which would make you understand why people don't dispose properly;
- Provide a solution, tell people where they can take hazardous waste;
- If they had a disposal center at apartment complexes, she would dispose of her waste properly;
- Put in another category saying "have you disposed of it yet?"
- Provide more information to educate about oil disposal and other wastes;
- Not sure what survey was trying to accomplish;
- Give options for disposal;
- More disposal center information;
- More clarification on items that were listed off. The survey itself was not clear;
- People may not know what quantities are used. For drain cleaner question they use it all so there is none left. Silly question;
- Remove "how much do you have left over?" question You should ask "How much do you have left to dispose of?"
- Always ask more questions;

- Ask about their knowledge of Household Waste products;
- Make it less "intellectual;"
- More information, closest sites;
- She doesn't understand the significance of the questions;
- Thought it was ok, but did not understand some of the groupings. Why were some of them grouped together?
- Maybe more specific and the meanings of collection day and permanent site. She had trouble understanding some of the questions;
- Tell me where to dump photographic chemicals;
- A little irrelevant to ask people how they dispose of bug spray - since you usually use it all. It would be better to ask how they dispose of empty containers;
- Clarify what collection sites might be - where are the permanent sites? Clarify!
- Too long;
- Further to look at car cleaners and solvents. Toxic and poisons to the environment;
- Have information more available for the public of where to take household wastes;
- Define collection days and collection sites;
- Explain why you are doing the survey;
- Per year categories are too small and distinctions are meaningless; units of measure are inappropriate for household cleaners, should be cans for example;
- Provide more specific information on amount of charges or taxes for disposal collection in a safe manner;
- Explain more about what household hazardous waste is. What options would cost;
- Be more specific about household chemicals;

3. Methodology improvements:

- Call around eight;
- Send in writing;
- Don't call so late;
- Timing is off, she's fixing dinner;
- No suggestions, not to call at dinner time;
- No suggestions, not to call at the dinner hour;
- Mail out or E-mail to people;
- Mail the surveys instead, no phone surveys;
- Call earlier in the day;

4. Questions people thought were offensive:

- The question "Have you heard of Household Hazardous Waste?" is demeaning;
- Stop asking about waging (wages?);
- Remove the race question;
- No demographics;
- Don't ask demographic questions;
- No demographic questions;
- Remove the race question;
- Outline the purpose of the survey indicating how it would benefit the public;

5. General comments:

- I don't know, people need to pull together;
- No change (in survey) she really wants curbside, especially old paint;
- She called last week for a water survey. She thinks public education would be a great help;
- We could go a long way if community passed law for recycling;
- I don't know. He would like to know about who is benefiting from the survey;
- Would like to know what became of the survey, inform the public of where hazardous waste collection sites are located;
- I think they should find a way to help old people keep up their homes. Affordably too - living off of social security, no extra money to keep up house
- Should be more disposal options fixed base Baxter Street;
- Nice if the survey helps do something;
- No, sister never threw stuff away. This should be a concern;
- Get more people involved locally;
- Hard to say, depends on people's personalities;

Open ended question number two: What would you like to know more about?

One hundred seventy five persons out of the 411 total (42.5%) participants offered specific answers to the last open-ended question. The responses to the question "What would you like to know more about?" allowed the establishment of subject groupings based on commonly requested information. The most commonly requested information was on the method of disposal of materials, the second most requested subject of interest were material specific, with 27 persons asking specifically about cleaners, twenty five persons asking specifically about paint products, and 23 people

asking about batteries. The last grouping of answers on this question is the miscellaneous response category.

1. Disposal questions:

A large number of respondents (82) asked specific questions about disposal. Respondents asked specific questions about the following issues, among these disposal issues were "I would like to know more about:"

- How to dispose of paint and paint products, solvents;
- I would like to know how my garbage service is disposing of it and if it is separated;
- Where to take everything;
- I need to know how to dispose of things. I don't think there is enough information;
- Recycling areas and what they take as far as oil or paint can full;
- proper way of disposal;
- where can we get rid of the stuff;
- where are the locations where we can deposit used batteries, paint products and household toxins;
- how to dispose of them without collection;
- what to do with them, should be fined if people do not obey;
- disposal of lighters;
- disposal of antifreeze;
- disposal of pesticides;
- cleaners, which to use;
- where and how to dispose of;
- all sites to dump waste;
- pampers, what do they do in landfills? They're all of the road and stuff. She had three children and she had five years of diaper washing;
- need disposal for people without transportation;
- more places to take batteries and tires rather than road disposal;
- would like to know if there is a collection center in his community;
- how disposal sites dispose of materials;
- where to take motor oil for disposal;
- should be made public, I would have two or three sacks of old paint stuff, needles . . . maybe I should take to nurses;

2. Cleaner questions:

Twenty-seven respondents asked specific questions about cleaners, among these questions were "I would like to know more about:"

- bath cleaners and various types of soap;
- general cleaning products;
- cleaners in kitchen around food;

3. Paint questions:

Twenty-five of 411 participants in the study asked specific questions about paint, among these questions were, "I would like to know more about:"

- Paint cleanup;
- where to wash brushes out;
- latex paint (is it hazardous?);

4. Battery questions:

Twenty-three of 411 participants asked specific questions about batteries, among these questions were "I would like to know more about:"

- Disposal of household batteries;
- Batteries, what to do with them;
- Small battery recycling;

5. Miscellaneous questions:

A number of people asked miscellaneous questions about Household Hazardous Waste, among these questions were, "I would like to know more about:"

- I would like to know how my garbage service is disposing of it and if it is separated;
- Oil issues, (disposal, the damage it does, etc.);
- fluorescent lights as HHW;
- interaction of all HHW or the disposal down the drain;
- chemicals, pouring bleach in the toilet and then pouring other chemicals in behind them, (is this wrong for the environment)?
- Things that sit around for a long time, how hazardous are they after a certain period?
- laws against waste;
- I get enough information in the mail;
- Many people said they need more information on "all of them;"
- How could the county do more?
- chemicals;
- car products, how could it hurt me . . . also car batteries and household;
- carpet chemicals, (some show on 48 hours). Using home cleaning products instead of dangerous chemicals. (i.e. vinegar, detergent, home remedies);
- recent household product, any new market stuff, If mixed with something that could cause a reaction;
- maybe more information about a safe home environment;
- household improvement stuff, (paint) what should you do with it, she doesn't know anything about the hazards of household cleaners;
- pesticides and insecticides, specifically yard chemicals;

- civil penalties levied against people who put stuff in the trash that should be recycled. He's worried about lawn chemicals. also hydrocarbons, oil change, and stuff;
- toilet cleaner and drain cleaners;
- would like to know how hazardous some of the daily cleaning chemicals are;
- how does Knox County dispose of hazardous waste;
- how to dispose of insulin needles;
- how to dispose of photographic chemicals;
- more household education on the disposal of things;
- more general information about disposal and pickup times;
- bath room cleaners and other basic (household) cleaners, I don't know what kind of damage it is doing;
- awareness is important;
- need curbside recycling service;
- where to put tars (tires?);
- anything that causes problems;
- where to take household grease;
- gimmicks on the market;
- motor oil;
- dangerous ones;
- drain openers that contain lye;
- what can be recycled and where;
- people should pay more attention to where products are stored - this should be made into an educational forum to avoid hazards for children;
- teach consumer responsibility;
- need information about how to protect children from hazardous materials and how to dispose;
- know more about the chemicals use din gardening and how to dispose of this material;
- location of hazardous materials sites, public should have a list of what is considered hazardous - sent out periodically to remind public;
- outcome of survey;
- things that cause cancer in the Knoxville area, such as improper disposal methods;
- components of cleaners use in average households;
- feel aware of most issues because of kids;
- more information from manufacturers about the products they make;
- illnesses cause by products listed in the survey;
- effects of pesticides on ground water;
- combination of pesticides, what effects;
- information on contents of products and their effects on humans;

- all issues, she has just become aware of the importance of proper disposal of household hazardous materials;
- much more information about mixing chemicals such as household products;
- thinks she is well informed and realizes that continuing education is important;
- pesticides and fertilizers, worried about water system and animals;

f. Selected data of interest:

Certain data stood out in the analysis as being useful to the study. These data points included the most frequently occurring statistics and those statistical analyses that yielded significant results. These are the results of primary interest to the study presented in bullet format.

- most of the respondents (26%) did not know that these products can cause health problems;
- the most frequently reported respondents' age was the 35 - 44 age group;
- most of the respondents (61.5%) of the respondents were female;
- most of the respondents (68.6%) of the respondents were homeowners;
- most of the respondents (34.8%) of the respondents lived in two person households;
- most of the respondents (83.8%) of the respondents do not have children under the age of six;
- most of the respondents (71.4%) of the respondents lived in single family homes;
- most of the respondents (73.3%) of the respondents reported that they are on public sewer systems;
- most of the respondents (29.3%) reported that they had attended college, but had not received a degree;
- most of the respondents (38.2%) reported that their annual family income was over \$50,000.00;
- most people put all categories of excess household hazardous materials away for later use with the exception of batteries, which most people were disposed of in the garbage (82.7%);
- 71.4% of the respondents were not aware that a household hazardous materials collection center was located in Knox County, Tennessee;
- 13.6% of the respondents did not know whether or not household hazardous materials cause pollution;
- educational attainment was not statistically related to awareness of the household hazardous waste collection center in Knox County (Pearson chi square 6.554 with 10 degrees of freedom and a p-value of .767);
- home ownership is statistically related to awareness of the collection center (Pearson chi square value of 13.151 with 2 degrees of freedom and a p-value of .001);

- age is statistically related to awareness of the collection center (Pearson chi square 18.110 with 4 degrees of freedom and a p-value of .001);
- home ownership was not statistically related to the number of times per year a person would use a collection site (Pearson chi square 4.523 with 3 degrees of freedom and a p-value of .210);
- education is not statistically related to the number of times per year a person would use a collection site (Pearson chi square 17.166 with 15 degrees of freedom and a p-value of .309);
- age is not statistically related to the number of times per year a person would use a collection site (Pearson chi square 18.914 with 15 degrees of freedom and a p-value of .218);
- home ownership is statistically related to distance willing to travel to use a collection center (Pearson chi square 12.168 with 3 degrees of freedom and a p-value of .007);
- age is statistically related to distance willing to drive to a collection center (Pearson chi square of 21.203 with 6 degrees of freedom and a p-value of .002);
- education is related to distance willing to travel to a collection center (Pearson chi square of 33.263 with 10 degrees of freedom and a p-value of less than .001);
- there were 37 reported zip codes among the study group;

g. Analysis of data from open ended questions:

The open-ended questions provided extremely valuable insight into the needs of the respondents.

1. How do you think this survey can be improved?

The comments collected from this portion of the survey were divided into five categories. These categories included surveyor improvements; survey improvements; methodology improvements; questions that people thought were offensive and general comments. The most frequently occurring comments are grouped together in these five categories and listed in a bullet format. The comments received from the surveyor category included suggestions to:

- slow down;
- speak gentler;
- speak better;
- and explain things better;

One surveyor apparently neglected to inform the participant that batteries were to be measured in number and not gallons;

The comments received for the survey improvements were by far the most extensive. Suggestions were made to:

- have a space for comments;
- provide a solution, tell people where to take hazardous waste;

- put collection areas at apartment complexes;
- provide more information and education;
- simplify the survey;
- ask more questions;
- ask fewer questions;

Most of the questions were asking that more specific information on collection sites and the materials involved. One participant suggested outlining how the study would benefit the public.

As with the other categories, the methodology suggestions were sometimes conflicting. These suggestions included:

- call around eight;
- don't call so late, don't call during dinner time;
- mail or E-mail the survey;

Some questions were offensive to certain participants. All but one of the questions study participants considered offensive were demographic questions. The one non demographic question was "the question 'Have you heard of household hazardous waste'? is demeaning.

The other questions considered offensive asked about for information about wages, race, and demographics in general.

General comments were charted covering a wide range of subject matter areas. Among the suggestions in this category were:

- curbside recycling;
- public education;
- laws for recycling;
- who is benefiting from the survey;
- the survey results;
- more disposal options;
- getting more people involved locally.

2. What would you like to know more about?

42.5% of the respondents offered suggestions on what they would like to know more about. These responses were divided into the categories of: disposal questions, cleaner questions, paint questions, battery questions, and miscellaneous questions. The largest number of people asked for more information about disposal options. Questions in this area were centered around how and where to dispose of materials.

Twenty-seven persons asked specific questions about cleaners. Twenty-five persons asked questions about paint product hazards and disposal. Twenty-three persons asked

questions about battery hazards and disposal. Numerous persons asked miscellaneous questions in the "would like to know more about" category.

In the final portion of this data analysis, it is apparent that numerous members of the study population are interested in the subject of household hazardous materials, and many seek more information to protect themselves and their families.

VITA

Charles Richard Yard was born in Knoxville, Tennessee on August 20, 1956. He attended public schools in Knoxville, and was graduated from West High School in 1974. He entered the University of Tennessee on a part time basis shortly after graduation from high school and worked throughout his college career. He continued to attend the University on a part time basis and was graduated in 1983 from the Bachelor of Science Program in Public Health Education. He re-entered the University in 1984, and was graduated from the University's Master of Public Health Program in Occupational Health and Safety in 1985.

In 1986, he began work at the Knox County Health Department as a Public Health Educator and was soon transferred to the Department's Environmental Health Division, where he worked until 1992 as an Environmental Specialist. In 1992, Mr. Yard was promoted and transferred to Oak Ridge Tennessee, where he began work in Health Physics at the Tennessee Department of Environment and Conservation's Department of Energy Oversight Division, overseeing DOE operations on the Oak Ridge Reservation. At DOE Oversight, Mr. Yard developed the Division's Facility Survey Program, a program that is designed to evaluate facilities on the Oak Ridge Reservation for all chemical, physical, and radiological hazards. The program has been in existence since 1995, and employs two Environmental Specialists and one engineer. These staff members were trained in Health Physics at the Oak Ridge Associated Universities. Mr. Yard currently supervises both the Facility Survey Program and the nuclear Materials Management Program at DOE-Oversight. He returned to the University of Tennessee in 1995 at the age of 38 to begin his quest for the Doctor of Philosophy degree in the College of Human Ecology's Department of Health and Safety Sciences. The attainment of this goal was realized in December of 1999.

Mr. Yard is married to Lora Brummette Yard, and has dedicated this Dissertation to his wife, Lora, his mother, Alma Allred Yard, and his father, the late Lt. Colonel Charles Richard Yard Sr., USAFR.