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An economic analysis of homeowners' preferences and perceptions regarding termite prevention and control in Louisiana

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AN ECONOMIC ANALYSIS OF HOMEOWNERS' PREFERENCES AND PERCEPTIONS REGARDING TERMITE PREVENTION AND CONTROL IN LOUISIANA

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ABSTRACT

This thesis used a mail survey to collect data on homeowners' preferences and perceptions regarding termite prevention and control in four metropolitan areas of Louisiana (Monroe, Alexandria, Baton Rouge, and New Orleans). Respondents were asked to rank four different alternatives differing in cost, treatment choice, and number of inspections on termite control options. These ordered preference data were then analyzed using a contingent ranking method to determine the homeowner's choice for termite control. It was found that more than three-fourths (77%) of homeowners preferred to control termites and were willing to pay for it.

In addition to contingent ranking, willingness to pay (WTP) value was elicited to examine homeowners' real and hypothetical willingness to pay for termite control. Real willingness to pay for termite control was calculated based on the house size and the respondent's current termite control contract. A hypothetical willingness to pay question was asked immediately after respondents were asked to rank the four alternative termite control options. The first question asked a dichotomous choice to respondents regarding whether they were willing to pay $0.56 for termite control. In the second stage, they were asked to state the WTP amount in an open format. The estimated average annual hypothetical and real willingness to pay for a homeowner were 32 cents and 16 cents per square foot of home living space, respectively, indicating that there was a significant level of hypothetical bias in the elicitation process. Length of home ownership, living space, market value of home, attitude about whether or not respondents consider termites to be an existing problem in their neighborhoods, income, ethnicity, and gender were significant variables in determining respondents' willingness to pay for termite control. The differences between hypothetical and real willingness to pay were

attributed to length of home ownership, living space, attitude about whether or not respondents consider termites to be an existing problem in their neighborhoods, and income.

CHAPTER 1: INTRODUCTION

Formosan subterranean termites (*Coptotermes formosanus* Shiraki*)* have proved to be one of the most formidable pests ever to invade New Orleans and neighboring areas in Louisiana. A native of China and Japan, Formosan subterranean termite (FST) infestation in the United States is relatively recent, occurring after World War II with their transport from Asian countries to the United States on ships as they returned from overseas (Henderson, 2000). Colonies have been found in Louisiana, California, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, Tennessee, Texas, and Hawaii. FSTs were first discovered in New Orleans in 1966 and have spread rapidly in the subsequent 36 years. FSTs could be thought of as super-termites because of their larger numbers in colonies, larger body size, voracity, and capacity to survive in adverse conditions relative to other termite species (Henderson, 2000).

FST damage is not limited to the wood structures of houses. They also attack railroad ties, pilings, utility poles, or even live trees (Smith *et al.*, 2001). Some of the most devastating damage is occurring in the New Orleans French Quarter Historical District, with cases of buildings and live trees collapsing from FST damage. Annual damage from the FST attacks in New Orleans is estimated at $300 million and at $500 million statewide (Hu *et al.*, 2000).

The public realized the seriousness of the FST problem only after 1990. In 1992, Hurricane Andrew caused the destruction of 350 trees in New Orleans, most of them infested by the FST (Henderson, 2000). Because the problem had grown so large in the French Quarter, the residents and business owners in the area demanded strong action to control it. In the meantime, the New Orleans Mosquito Control Board was renamed the New Orleans Mosquito and Termite Control Board in 1996 (Henderson, 2000). Five million dollars in federal funding was obtained in 1998 to attempt to control FST destruction. This funding was subsequently granted annually

(Office of Agricultural and Environmental Sciences, Louisiana FY 2000-01). The United States Department of Agriculture (USDA) Agricultural Research Service (ARS) in New Orleans provided oversight of the Formosan research and control efforts. Specific methods for containing and/or controlling the insect were urgently needed and different research projects were initiated in 1998. In the same year, the governor of Louisiana organized a state initiative on FST control. USDA ARS and Louisiana State University had key roles in the development of new tools and education programs designed to facilitate termite control (Smith *et al.,* 2001).

To fight the FST effectively, it is necessary to understand the extent of its occurrence across geographical regions with different types of home construction and homeowner socio-demography in Louisiana. Further, it is also important to ascertain citizens' attitudes regarding termite control. To date, no studies have been conducted to determine how much Louisiana homeowners are willing to pay for termite control. Their preferences of control efforts may vary with geographical area, type of home construction materials used, their risk preferences, and socio-demographics. In early 2002, economists at the Louisiana State University Agriculture Center (LSU AgCenter) were granted funding to study the economic aspects of the FST, including consumers' preferences and attitudes toward control levels, as well as consumer education level regarding the extent of the FST presence in Louisiana.

This study is a part of the LSU AgCenter termite prevention and control program. It examines the factors that influence real versus hypothetical willingness to pay, and homeowner choice, for termite control. Specifically, the study provides updated information about homeowner attitudes and preferences about termite control in Louisiana.

1.1 Problem Statement

Although the FST infestation is a relatively new problem in Louisiana, the urgency is great because of the high degree of potential damage it can cause. Thus, many questions are of great interest concerning termite control in Louisiana, such as: (1) What are homeowners' attitudes about the FST?, (2) What is the level of awareness about the FST?, (3) Who are the most vulnerable groups/areas for termite infestation?, (4) What are homeowners' control preferences?, (5) How much are homeowners willing to pay for termite control?, and (6) Which agency do homeowners trust most to control FSTs?

Presently available termite control options are liquid treatment, bait treatment, and a combination liquid and bait treatment. Liquid treatment is the least expensive method, followed by bait and a combination of bait and liquid. Homeowners with different degrees of risk preference and affordability may prefer one of these options, or no treatment option, or the other more costly options.

In addition to homeowner preferences and attitudes regarding termite control, this study also compares their stated willingness to pay for termite control over their existing real payments to pest control operators. Since in many cases, people's intentions and actions are not the same, this study will analyze the factors that contribute to differences between stated and actual behavior.

1.2 Research Objectives

The main goal of this study is to ascertain preferences of Louisiana homeowner termite control options. The specific objectives are to:

1. identify the attitudes and awareness levels of homeowners regarding the FST in Louisiana;

2. identify homeowner termite control options in Louisiana;
3. identify the determinants that influence homeowner preferences for termite control options;
4. estimate individual homeowner willingness to pay (WTP) for termite control and compare real versus hypothetical willingness to pay;
5. determine if an “information effect” exists associated with the level of termite infestation in metropolitan areas; and
6. derive policy conclusions that are helpful in addressing FST prevention strategies in Louisiana.

CHAPTER 2: LITERATURE REVIEW

This study utilized the contingent ranking approach to determine Louisiana homeowner preferences for different termite control options. Much literature is available on this topic. The most relevant literature is reviewed and presented in the first section of this thesis. Similarly, real versus hypothetical commitment has always been an issue in the resource economics literature. A separate section of the literature review is dedicated to this issue. The final section of the literature review relates to knowledge and information effects in the contingent market.

2.1 Contingent Ranking

Contingent ranking, a stated preference technique, was originally developed by marketing practitioners to isolate the value of individual product attributes or performances in hypothetical situations where these attributes, or combinations of these attributes, are not available in the market (Foster and Mourato, 2000). Stated preference data are the respondent's expressed preferences for those attributes in hypothetical scenarios. In this method, respondents are asked to rank their choices completely rather than just choose the one that they most prefer (Lareau and Rae, 1989).

In resource economics literature, the contingent ranking method is used to estimate the value for environmental amenities and other non-market goods and services. Respondents rank these alternatives to maximize their utility or to minimize cost. There is always a tradeoff between the quality of goods or services and the price. The contingent ranking approach provides the basis for computing this tradeoff (Garrod and Willis, 1997).

Contingent ranking assumes that respondents have the capacity to evaluate, compare, and rank alternatives versus assigning a value to these various alternatives. This assumption is not always true. In general, research has shown that people feel more comfortable when comparing

and ranking among given choices with costs and benefits assigned, rather than estimating an explicit value (Smith and Desvouges, 1986).

Contingent ranking has many benefits as compared to contingent valuation. The contingent valuation is a method of valuing non-marketed goods or services by asking consumers to place a value on a hypothetical change in the provision of these goods (Hanemann, 1994). The most important one, as noted by Smith and Desvousges (1986), is that respondents are more accurate in ordering their choices than in assigning particular value. Boyle *et al.* (2001) found that respondents do not use ties in ranking formats mainly because they carefully make distinct choices and are forced to order all the choices. Contingent ranking minimizes the risk of strategic behavior (Riera and Penin, 1997), which is often observed when respondents strategically assign any WTP value other than real value.

Contingent ranking has been successfully utilized for the valuation of a variety of environmental goods, including the demand for electric cars (Beggs *et al.*, 1981), water quality improvement (Desvousges *et al.*, 1983), river water quality improvement (Smith and Desvousges 1986), diesel fuel odor reduction (Lareau and Rae, 1989), the recreational benefits of public forests (Hanley and Ruffell, 1993), the environmental health and employment effects of energy programs (Johnson and Desvousges, 1997), air quality valuation (Riera and Penin, 1997), biodiversity conservation (Garrod and Willis, 1997), amenity loss estimates for recreational users (Garrod and Willis, 1998), conservation benefit of environmentally sensitive areas (Hanley *et al.* 1998), curbside waste disposal (Caplan *et al.*, 2002), and atmospheric pollution reduction (Ortuzar and Rodriguez, 2002).

Beggs, Cardell, and Hausman (1981) first applied an ordered LOGIT discrete probability choice model to ranked data to assess the potential demand for electric cars. Valuation of

existing product attributes by consumers was estimated from an existing demand. However, the demand for new products depends on their projected attributes. They generated potential consumer preferences for 16 different car designs with more than nine attributes that were not available in the market at that time. They noted two advantages of contingent surveys over market data. First, potential consumer reaction to the products and/or attributes is obtained. Second, more information can be elicited from a person in reference to product features or attributes. They were able to estimate common taste parameters using an ordered LOGIT model by relating attributes, preferences, and socio-demographic information such as the price of the car and the income of the consumers, fuel cost, and income. This model helps to identify new products that consumers are seeking.

Smith and Desvousges (1986) found that ranking sets containing more than eight elements becomes cognitively unfeasible for respondents, and that the best results are obtained when ranking sets are limited to between four and six alternatives.

Lareau and Ray (1989) used contingent ranking to value the willingness to pay for diesel odor reduction in Philadelphia. They tried to answer theoretical concerns in applying contingent ranking methodology. In contrast to pair-alternative or most preferred alternative procedures, ranked data more fully describe a respondent's preferences. This method suggests that a generalization of the LOGIT specification can take advantage of the additional information revealed between most and least preferred alternatives. The generalized probability choice model assumes that an individual's choice is influenced by both the alternatives and by personal tastes, for which the usual mix of socioeconomic and demographic factors serve as proxies. The model also assumes that individuals select alternatives in the order they actually were chosen. Their survey included 12 choices of diesel odor exposure levels and the increased transportation cost

associated with the reduction of odor. The estimated WTP tradeoffs were stable across different socio-demographic characteristics. This study assisted in delineating how much vehicle diesel odor reduction is worth.

Garrod and Willis (1997) used the contingent ranking approach for valuing non-use benefits of enhancing forest biodiversity on government forestland in the United Kingdom. Respondents were asked to compare the four different combinations of forest management standards. Garrod and Willis estimated the public's WTP to increase the forest management area used for biodiversity at the expense of community timber production. Willingness to pay in pence per year was estimated in three categories and was found to be 30.3 to 33.4 p for standard biodiversity conservation, 51.7 to 56.4 p for a desired standard of biodiversity conservation, and 18.5 to 20.7 p for conservation of native woodland. Garrod and Wills (1998) also estimated the loss of amenity value for inland waterways from public utility service structures. Their survey asked respondents to rank four alternatives. Each alternative was specified with a particular mix of amenity-reducing public utility service structures such as pipe bridges, pylons, and other overhead cables. Over 80 percent of the users were willing to pay higher utility bills to reduce the number of structures.

Foster and Mourato (2000) estimated the impacts of pesticide use in the UK. Their paper develops an application of the contingent ranking methodology to the valuation of multiple environmental impacts of pesticide use by using a "green consumer good" payment vehicle. They assumed that environmentally friendly methods of wheat production cause higher costs that are translated into higher prices for bread. They presented four alternatives having three attributes each: the price of bread, the number of cases of illness per year, and the number of bird species in decline. Each attribute had four alternatives.

Foster and Mourato's study utilized both a Most Preferred Alternative model (MPA) and a Ranked Data model. These models are types of what are known as Random Utility models. In this framework, the indirect utility function for each respondent can be broken into two parts: deterministic elements and stochastic elements. The MPA model was found to be more efficient than the Ranked Data model in this study. They also conducted specification tests, validity tests, and convergent and criterion validity tests for the study. The specification test was conducted to compare the MPA and Ranked Data model. They relied more on the MPA model; however, the estimated coefficients were not significantly different for the two models. The WTP amount was estimated from the Ranked Data model. They estimated coefficients by using both models to increase the reliability of their estimation. Their validity test was concerned with establishing whether or not willingness to pay varies systematically with respondents' socio-demographic characteristics as suggested by economic theory. They found that higher income respondents exhibited greater WTP. Convergent validity was tested by comparing the WTP amount estimated to conserve bird biodiversity in the United States, Sweden, and Norway. If the value of WTP estimated from other places is not significantly different, the result is convergent, hence consistent. The authors found their results to be convergent.

The findings of this study were that on average consumer willing to pay 0.7 pence extra per loaf of bread to avoid a case of human illness, and 5.3 pence per loaf to protect one species of farmland bird. However, a criterion validity test conducted of the reliability of the WTP estimation with real payments made posed a challenging question regarding the study's validity. WTP amounts estimated were unrealistically high as compared to what people paid in actual practice. Because of this gap between estimated and actual WTP, the authors suggested adjusting this estimation before applying it to policy decision-making.

Riera and Penin (1997) used contingent ranking to value the variation in air quality from a transportation project in Barcelona, Spain. They presented five scenarios with 10%, 20%, 30%, 40%, and no reduction of air pollution with 10,000 pesatas (ptas)[1], 25,000 ptas, 35,000 ptas and 50,000 ptas respectively. A mean value of 1,267 ptas as WTP was estimated for a percent decrease in air pollution. This value was used to calculate the social cost-benefit analysis.

Caplan *et al.* (2002) used contingent ranking to value households' willingness to pay for different curbside trash-separation services in Ogden, Utah. Three options were presented to the respondents for ranking, Option 1: garbage-only pickup that does not add to the usual disposal cost of $10.65; Option 2: resident would separate green waste only and the cost would increase from $12.15 to $12.65; Option 3: residents would separate green waste and recyclables and the cost would rise from $13.15 to $13.65. They found that Ogden residents were willing to pay approximately 3.7-4.6 cents per gallon of waste diverted for a curbside service that enables the separation of green waste and recyclable material from other solid wastes. Compared to other waste diversion experiments, contingent ranking was cost effective.

2.2 Hypothetical Versus Real Willingness to Pay

Non-market goods or services are valued in a hypothetical market. The valuation obtained from a hypothetical market has been found to be questionable because in most cases, there is a difference between what people say and what people do. Can we treat hypothetical value as real when it is obtained from a hypothetical market ? This question led Neill *et al.* (1994) to conduct an experiment that compared the real and hypothetical payments for maps and paintings as experimental goods. They found that hypothetical payment is significantly higher

[1] Currency of Spain

than those based upon real economic commitments. A Vickery auction was used to find real economic commitments for the goods. In Vickery auctions, the highest bidder wins but pays only the second-highest bid. Neill *et al.* rejected the null hypothesis of equality of WTP from the Vickery auction and WTP obtained from the contingent valuation method. They also rejected the null hypothesis of equality of WTP from the Vickery auction and WTP from a hypothetical Vickery Auction. However, they failed to reject the null hypothesis of equality of WTP obtained from a hypothetical Vickery auction and WTP obtained from contingent valuation. In this experiment, the research was designed in such a way that the goods valued and the provision rule do not influence the true WTP. The results were based on private goods. This study can be extended to find how real versus hypothetical commitment differs in public or club goods.

Cummings *et al.* (1995) tested the incentive compatibility of majority rule referenda by using the dichotomous choice (DC) format. In this format, the majority decision is applied; therefore, a subject has no incentive to choose other than true choice. They utilized DC format in controlled experiments for both the real and hypothetical market for private goods. Their experimental goods were a $13.97 electric juice maker, a $15.00 box of chocolates, and a $1.50 calculator. Their DC prices were $8.00, $3.50, and $3.00 for juicer, chocolate, and calculator, respectively. They tested the hypothesis of no association of "yes response" to hypothetical and real WTP for both within and between the subjects. However, they rejected the null and found that the "yes response" is associated with hypothetical and real markets. They found that value elicited from hypothetical DC is not incentive compatible. This result was true across the different private goods, different geographic student populations, different experimenters, and different questionnaire formats and also among non-students.

An experiment conducted by Johannesson *et al.* (1997) shows a more controversial result than previous studies which failed to reject the null hypothesis of equality of hypothetical and real commitment for a private good, i.e., a box of chocolates. This was an application study. The mean willingness to pay was SEK[2] 87.40 in the second-price auction and SEK 89.5 in the hypothetical open-ended WTP questions. The mean WTP amount in the two groups did not differ significantly. Because of the smaller sample size, however, the standard deviation of the hypothetical experimental group was quite high (75.37) as compared to the second-price auction (39.47) hence researchers suggested further research on the issue.

A controversial result obtained by Johannesson *et al.* (1997) drives Neill (1999) to seek an explanation for the results. Neill argues that different results may arise for three main reasons. First, different payment mechanisms were used where subjects were constrained by limited funds with which to pay. Previous experiments, however, were not limited by this constraint because there was a loan provision for the subjects. Second, they used a familiar brand of chocolates as an experimental good whose price might be known to the subjects. Third, a smaller sample size was used where the mean confidence interval for the hypothetical experimental group was quite wide (SEK 35.58 to SEK 143.41). This wider interval estimate undermines the results.

Spencer *et al.* (1998) conducted an application experiment to determine the preferences and willingness to pay for volunteer water-quality monitoring in two lakes in Rhode Island. The subjects were students for this experiment. They found that there was no statistical difference between hypothetical and real willingness to pay for a water-quality monitoring program. Results

[2] Swedish Crowns

also indicated that a female subject majoring in ecology/environment believed that "everyone is responsible for water quality monitoring."

The differences in hypothetical and real willingness to pay not only arise due to upward hypothetical biases but also due to downward free-ride biases. If the public good is supplied from outside the experimental subject, there is a chance of free-ride downward biases in real referenda. Taylor (1998) tested this free-ride effect through closed referenda, which do not allow provision of goods outside the voting group. Taylor experimented after the Citizen's Guide[3] distribution was completed by the Southeast Research and Information Center (SRIC), a non-profit environment organization. SRIC could not reach more than 500 low-income targeted families and they did not have other sources of funds to distribute the Citizen's Guide to those low-income families except the experimental subject's contribution. Therefore, Taylor called it a closed referendum. Taylor's experiment was to collect funds through experimentation to distribute the guide among these families. She tested the null hypothesis that yes responses in real and hypothetical referenda are independent of payment conditions. This test rejects the null hypothesis that there is no significant difference between voting behavior in the closed real and closed hypothetical referenda. The finding shows that majority rule referenda are not fully incentive compatible for eliciting WTP for public goods.

Smith (1999) commented on findings by Cummings *et al.* (1997) where they rejected the null hypothesis of equality of yes/no responses in hypothetical and real scenarios. Smith argued that Cummings *et al.*'s work did not confirm the scope requirement. Cummings *et al.* summed the result obtained from smaller sample groups and larger sample groups. In their experiment,

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[3] This guide helps to detect contamination in aquifers for low-income Hispanic households in Albuquerque, New Mexico; Cumings *et al.* (1997) and Cummings and Taylor (1998).

however, they proposed the same contribution ($10) for larger or smaller sample sizes. This violates the expectation of greater percentage voting for referenda in replication in larger groups where more books could be provided than in a smaller group. In a nutshell, Smith argued that choice information alone is not sufficient to judge the experimental results where the context and the nature of the goods matter a lot.

A kind of calibration application study by Botelho and Pinto (2001) used an open-ended survey of student-between-subjects to find out the hypothetical, real, and predicted real willingness to pay for an informative leaflet on the otter (an endangered animal species) in the Neiva River in Portugal. Goods and question formats were the same across the real and hypothetical treatment. They rejected the null hypothesis that the two distributions come from the same population. They also tested whether the hypothetical values are as informative as the real values by using a statistical calibration approach suggested by Blackburn *et al.* (1994). They found that the distribution of predicted real WTP was good match for the distribution of real WTP. That means that real and predicted real WTP had the same distribution. Their results suggest that, although biased, hypothetical valuation conveys useful information about the individual's real WTP.

Explaining the disparity between hypothetical and real WTP is a challenge. Paradiso and Trisorio (2001) attempted this task by controlling indirect and direct knowledge of goods through a controlled experiment. They tested the following hypotheses: 1) equality between estimates obtained from indirect knowledge in hypothetical settings and estimates obtained from indirect knowledge in real settings; 2) equality of estimates obtained from hypothetical settings with direct knowledge and real settings direct knowledge; 3) equality of estimates obtained from direct and indirect knowledge in hypothetical settings; and 4) equality of estimates obtained from

indirect and direct knowledge in real settings. The first two null hypotheses were rejected, which suggests that there is a significant difference between estimates obtained from real and hypothetical scenarios controlling knowledge level. These results were congruent with most earlier studies. The last two null hypotheses were also rejected. These results suggest that knowledge settings really matter. If the subjects are familiar with the goods in question, their evaluation is closer to the real value and vice versa. (Knowledge about termites might be related to real and hypothetical WTP.)

The gap between intention and action as reflected by hypothetical and real willingness to pay is significantly different in past studies. Persistence of this difference motivated List and Shogren (2002) to find the relation between hypothetical and real willingness-to-accept (WTA). They tested four different hypotheses. First, does institutional framing matter for hypothetical offers? They tested the null hypothesis of equality of WTA obtained from hypothetical open ended and hypothetical random n^{th} offers. They failed to reject the null hypothesis. This result suggests the open-ended format alone cannot be held responsible for the bias. Second, they tested the null hypothesis of equality of actual and hypothetical WTA offers. To test this hypothesis, they tested two more null hypotheses: 1) equality of mean real and mean hypothetical offers that they called an "unconditional calibration" hypothesis. They rejected the null and found hypothetical and real WTA offer distributions differ significantly; 2) they rejected the null and found bias that increases with the market value of the good. They tested for three categories of goods: low-valued, medium-valued, and high-valued. Third, a good-neutral hypothesis, where low-to high-valued goods have a similar kind of calibration function, was tested. They failed to reject the hypothesis. Market value does not matter for the calibration factor. Fourth, there are no

differences of WTA offers due to age, gender, gift[4], and income. They found that older people males, or a person selling more gifts in an actual auction understate the real offer. Finally, they concluded that people understate their real WTA in hypothetical regimes in both demand-revealing and non-revealing conditions. Controlling person-specific effects, hypothetical and real statements are equivalent on the margin.

2.3 Imperfect Information and WTP Amount

The existence of imperfect information may not only affect the equilibrium price and quantity of a good or service, but may also call into question the correspondence between competitive prices and economic efficiency (Nicholson, 2000). Incorrect decisions based on faulty information about price or quality can result in an inefficient allocation of resources.

Imperfect information in contingent valuation or ranking studies can affect the validity and reliability of the WTP amount. Information about the goods in question affects the WTP amount. Whitehead *et al.* (1995) assessed the validity and reliability of contingent valuation by comparing on-site users, off-site users, and non-users of natural resources. On-site users are survey respondents who have been consumptive or non-consumptive on-location users of natural resources. Off-site users are respondents who have read, seen a program, or talked about natural resources, and non-users are respondents who have never seen or heard anything about natural resources. Validity and reliability of WTP depend on the amount and type of information that individuals have. Validity and reliability increase with familiarity. They found that WTP stated by on-site users was more reliable than that stated by off-site users and non-users. This result

[4] Experimental goods that a person could sell in the actual auction.

was consistent with their assumption. Their result also showed that usable WTP responses were obtained from informed off-site users.

Elicitation of true WTP requires survey participants to be familiar with environmental resources. Most of the time there are differences on the part of respondents in perceived quality and true quality of resources. Blomquist and Whitehead (1998) studied the effect of resource quality information on the WTP value for wetland preservation. They asked respondents dichotomous choice questions for four different wetlands with different qualities. They found that information about quality is a determinant of WTP for wetland preservation.

Paradiso and Trisorio (2001) studied people's WTP by controlling indirect and direct knowledge of goods through controlled experiment. They found higher valuation for a good at hypothetical settings than at real settings for the indirect knowledge of goods in both cases. Similarly, they found higher valuation from hypothetical settings direct knowledge of good than real setting. They also found significantly different WTP values from direct and indirect knowledge-hypothetical settings. Similarly, two valuation figures were significantly different when these figures were obtained from direct and indirect knowledge in real settings.

Similar effects might be expected for this termite study, where people in New Orleans are expected to be willing to pay more than those in Monroe, Alexandria, or Baton Rouge, because of knowledge and the direct impact of the termites.

CHAPTER 3: SURVEY METHODOLOGY

3.1 Population and Sample

The survey population consisted of all owners occupying homes in four metropolitan areas in Louisiana. These respondents might own single-family houses, multi-family houses, apartments, condominiums, or townhouses. Four metropolitan areas, New Orleans, Baton Rouge, Monroe and Alexandria, were taken as a stratum of the sample. The locations consisted of 100,017, 104,149, 38,559, and 35,386 homeowners respectively. Selective random samples of 6,000 homeowners were chosen from the sampling frame maintained by Best Mailing List, Incorporated[1], a private list company. A total of 5,641 homeowners were contacted through the use of a mail survey: 1,490 from Monroe, 1,305 from Alexandria, 1,395 from Baton Rouge, and 1,451 from the New Orleans Metropolitan areas. To give more emphasis to the French Quarter area in New Orleans, 52 homeowners were sent survey questionnaires and were accounted for within New Orleans. All the participants surveyed in this study were people living in their own homes.

3.2 Instrumentation

To achieve the objectives of this study, a mail survey questionnaire was utilized. A copy of the survey questionnaire is presented in Appendix 1. The questionnaire was the product of experience, literature review, and interaction with experts in the field of entomology. The survey questionnaire comprised four sections. Details of each section are presented below.

[1] Address: 7505 East Tanque Verde Road, Tucson, AZ 85715.

3.2.1 Home and Homeownership

The first section contained information related to home and home ownership and asked respondents about their home type, the length of ownership, amount of living space, and whether or not the home contained a garage. This section also contained homeowners' estimations of the market value of their homes, materials used in home construction, home foundation type, whether or not they had a mortgage on the home and the mortgage length, and whether or not they planned on selling their homes in the future. Home-and homeownership-related variables are presented in Table 3.1.

3.2.2 Knowledge of Termites

The second section of the survey instrument consisted of questions related to homeowners' knowledge and experience regarding termites and termite damage. This section included questions such as whether or not termites of any kind had ever been found in their homes, if the survey participant was the owner when termites were found in their home, and the year or years of termite infestation. Questions related to termite damage, damage coverage and types of termite infestation were included in this section. In this section, homeowners were asked whether they considered termites to be an existing problem in their neighborhood, whether they had a termite prevention contract. If they had a contract, participants were queried as to the amount of initial installation fees and annual renewal fees. This section also contained questions related to warranties associated with termite prevention contracts and the contract purchase plans of homeowners. In the same section, homeowners were asked to state whether or not they had heard of the FST. If they had, they were asked to state the source(s), such as TV, radio, or newspaper. The variables related to homeowners' knowledge and experience of termites are presented in Table 3.2.

Table 3.1. Variable Definitions for Home and Homeownership

Variable	Definition
LOCATION	Survey location: 1= Monroe; 2= Alexandria; 3= Baton Rouge; 4= New Orleans
HOMTYP	Home types: 1= single family; 0= others (multifamily, apartment, condominium, and townhouse)
OWNLENGTH	Homeownership length: 1= less than 5 years; 2= 5-10 years; 3=11-15 years; 4= 16-20 years; 5= more than 20 years
LIVSPACE	Home living space:1= less than 1,499 square feet; 2= 1,500-1,999 square feet; 3= 2,000-2,999 square feet; and 4= more than 3,000 square feet
GARAGE	Have garage (1= yes)
MKTVAL	Approximate current home market value: 1= less than $49,999; 2= $50,000-$99,999; 3= $100,000-$199,999; 4= 200,000-$299,999; 5= 300,000 or more
HOMCONST	Home construction type: 1= wood frame house with solid wood siding; 2= wood frame house with non-wood siding (aluminum, vinyl, brick, pressboard); 3= others (steel framed, concrete block construction, prefabricated manufactured home, trailer home)
HOMFOUND	Home foundation: 1= concrete slab; 2= raised construction
MORTG	Have a mortgage on your home? (1= yes; 0= no)
MORTLENG	Mortgage total length in years
MORTLEFT	Number of years left to pay mortgage
HOMSELL	Plan to sell your home (1= yes; 0= no)
SELLWHEN	Homeowner's plan for selling home: 1= in the next 6 months; 2= in 6 months- 1 year; 3= 2-5 years from now; 4= 6-9 years from now; 5= 10 years or later
SELLJOB	Reason for selling home: have a new job and need to move (1= yes 0= no)
SELLTAX	Reason for selling home: taxes are too high (1= yes; 0= no)
SELLTERM	Reason for selling home: termite problem (1= yes; 0= no)
SELLRET	Reason for selling home: retirement (1= yes; 0= no)
SELLOTHR	Other reasons for selling home

Table 3.2. Variable Definitions for Homeowner Knowledge of Termites

Variable	Definition
TERMFND	Termite found in home (1= yes; 0= no)
TERMOWN	If termite found in home, respondent was the homeowner (1=yes; 0= no)
TERMDAMG	Estimation of termite damage cost: 1= <$2,499; 2= $2,500-4,999; 3= $5,000-7,499; 4= $7,500-9,999; 5= $10,000-12,499; 6= $12,500-14,999; 7= $15,000-17,499; 8= $17,500-19,999; 9= $20,000 or greater; 10= respondent does not know how much the damage cost
WARRANT	If termites have caused damage to a home and homeowner had termite control contract, then: 1= damage cost covered by termite protection warranty; 2= damage cost paid for by respondent out of his/her own pocket; 3= respondent does not know
INFTYPE	Type of termite infestation(s): 1= native subterranean termites; 2= Formosan Subterranean Termite; 3= dry-wood termites; 4= respondent does not know; 5= more than one type of infestation
TERMNEIGH	Respondent considers termites to be an existing problem in the neighborhood: 1= no; 2= yes; 3= respondent does not know.
TERMCONT	Homeowner had a termite prevention/control contract with professional pest control operator (1= yes; 0= no)
INSTFEE	If yes, estimate of initial installation fee: 1= less than $400; 2= $401-800; 3= $801-1,200; 4= $1,201-1,600; 5= $1,601-2,000; 6= more than $2,000; 7= respondent does not know
RENFEE	If yes, estimate of an annual renewal fee: 1= less than $99; 2= $100-199; 3= $200-299; 4= $300-399; 5= $400 or greater; 6= respondent does not know
WARCOV	If yes, warranty coverage: 1= re-treatment only; 2= re-treatment plus payment for damages to structure resulting from termite infestation; 3= respondent does not know
CONTPURC	If no, homeowner plans for termite prevention contract in the next year: 1= no; 2=yes; 3=respondent does not know.
FSTHEARD	Heard about Formosan Subterranean termites: 0= no; 1= yes
TELEVISION	If yes, by television: 1= yes; 0= no
RADIO	If yes, by radio: 1= yes; 0= no
NEWSPAPER	If yes, by newspaper: 1= yes; 0= no
FRIEND	If yes, by friend: 1= yes; 0= no
HRDPCS	If yes, by pest control service: 1= yes; 0= no
HRDEXT	If yes, by extension service: 1= yes; 0= no
HRDGOV	If yes, by government agency: 1= yes; 0= no
HRDOTHR	If yes, by other source: 1= yes; 0= no

3.2.3 Contingent Ranking

The third section contained contingent ranking and contingent valuation questions. This section was designed with the help of the LSU AgCenter's experts in the field of entomology. The four scenarios of termite control were developed based on existing products in the market. These scenarios differed by three attributes: the amount and kind of pesticide use, the cost of treatment involved, and the number of inspections by pest control service providers. The contingent ranking scenarios in the questionnaire were as follows:

Alternative 1: "Do not engage in any sort of activities, such as contracting with a pest control operator or company, to protect against termites. This option will cost you no money. With no form of termite protection or control, however, the chance that termites will attack your home over the next five years is significant."

Alternative 2: "Contract with a pest control operator or company to install a liquid termite prevention solution (an insecticide that is applied in a trench dug around your home) around the exterior of your house. The cost of this option is as follows (based on hypothetical 2,000 square feet house): initial inspection and installation fee=$750 an annual renewal fees=$113 per year (including first year). This equates to an average cost over the next five years of $0.13 (thirteen cents) per square foot per year. With this service, you will receive one home inspection per year. The contract lasts for five years."

Alternative 3: "Contract with a pest control operator or company to install a termite baiting system around the exterior of your home (small, self-contained insecticide bait stations are placed into the ground around the perimeter of your house) to assist in preventing termite infestation. The cost of this option is as follows (based on a hypothetical 2,000 square foot house): initial inspection and installation fee=$2,000; annual renewal

fees=$450 per year (including the first year). This equates to an average cost over the next five years of $0.43 per square foot per year. With this service, you will receive a minimum of one inspection per month. The contract lasts for five years."

Alternative 4: "Contract with a pest control operator or company to install a liquid termite prevention solution around the exterior or your house PLUS a termite bait system which further prevents termites. The cost of this option is as follows (based on a hypothetical 2,000 square foot house): initial inspection and installation fee=$2,750, annual renewal fees=$563 per year (including the first year). This equates to an average cost over the next five years of $0.56 per square foot per year. With this service, you will receive a minimum of one inspection per month. The contract lasts for five years."

Homeowners were asked to rank all alternatives in their order of preference from the most preferred to the least preferred.

Also in this section, respondents were asked whether they were willing to pay more than $0.56 per square foot per year for termite protection that was 100% guaranteed for the life of the home. Respondents were asked to state their maximum willingness-to-pay amount whether or not they were willing to pay more than $0.56. This double bounded open-ended question was a means to elicit respondents' maximum WTP for termite control, which might be more or less than $0.56. The contingent ranking related variables are presented in Table 3.3.

In addition to contingent ranking questions, this section contained two rating questions. One question was related to criteria that respondents would use in contracting with pest control service; the other question was related to rating homeowner trust in different agencies for their ability and performance to provide information and guidance about the safety, effectiveness,

Table 3.3. Variable Definitions for Contingent Ranking and Willingness to Pay

Variable	Definition
FIRST	Homeowner's first preference for termite control: 1= alternative 1; 2= alternative 2; 3= alternative 3; 4= alternative 4
SECOND	Homeowner's second preference for termite control: 1= alternative 1; 2= alternative 2; 3= alternative 3; 4= alternative 4
THIRD	Homeowner's third preference for alternative termite control options: 1= alternative 1; 2= alternative 2; 3= alternative 3; 4= alternative 4
FOURTH	Homeowner's fourth preference for alternative termite control options: 1= alternative 1; 2= alternative 2; 3= alternative 3; 4= alternative 4
WTP	Willing to pay more than $0.56 per square foot per year for termite prevention that guarantees 100% to prevent termites (1=yes; 0= no)
WTPYES	If yes, the maximum dollar amount respondent would be willing to pay.
WTPNO	If no, the maximum dollar amount respondent would be willing to pay
CHEMUSE	Homeowner's evaluation regarding the amount of chemicals that are being used to fight termites and other insect pests in Louisiana: 1= not enough used 2= right amount is being used; 3= too much is being used; 4= respondent does not know; 5= respondent does not care

and application standards of the chemicals used to control termites in Louisiana. Variable definitions related to criteria use in contracting with a pest control service are presented in Table 3.4. Variables related to respondents' level of trust for different agencies' ability to provide information and guidance about safety, effectiveness, and application standards of the chemicals used to control termites are presented in Tables 3.4 and 3.5.

3.2.4 Socio-Demographic Characteristics

The last section of the questionnaire contained questions related to respondents' socio-demographic characteristics. These characteristics were gender, age, marital status, education, income, and ethnic background. These characteristics-related variables are presented in Table 3.6.

Table 3.4. Variable Definitions Related to Homeowner Pest Control Service Selection Criteria

Variable	Definition
RATCOST	Rating for "cost" as selection criteria to use in contracting with a pest control service by homeowner: 1= very unimportant; 2= unimportant; 3= neither important nor unimportant; 4= important; 5= very important
RATQUAL	Rating for "quality of service" as selection criteria to use in contracting with a pest control service by homeowner: 1= very unimportant; 2= unimportant; 3= neither important nor unimportant; 4= important; 5= very important
RATRESP	Rating for "responsive" as selection criteria to use in contracting with a pest control service by homeowner: 1= very unimportant; 2= unimportant; 3= neither important nor unimportant; 4= important; 5= very important
RATTREAT	Rating for "treatment is successful" as selection criteria to use in contracting with a pest control service by homeowner: 1= very unimportant; 2= unimportant; 3= neither important nor unimportant; 4= important; 5= very important
RATGUAR	Rating for "guarantee" as selection criteria to use in contracting with a pest control service by homeowner: 1= very unimportant; 2= unimportant; 3= neither important nor unimportant; 4= important; 5= very important
RATLENGTH	Rating for "length of contract" as selection criteria to use in contracting with a pest control service by homeowner: 1= very unimportant; 2= unimportant; 3= neither important nor unimportant; 4= important; 5= very important
RATREC	Rating for "recommendation of friend" as selection criteria to use in contracting with a pest control service by homeowner: 1= very unimportant; 2= unimportant; 3= neither important nor unimportant; 4= important; 5= very important
RATINF	Rating for "information from advertisement" as selection criteria to use in contracting with a pest control service by homeowner: 1= very unimportant; 2= unimportant; 3= neither important nor unimportant; 4= important; 5= very important

Table 3.5. Homeowner Level of Trust That Entities Provide Information and Guidance About Safety, Effectiveness, and Application Standards of Chemicals Used to Control Termites

Variable	Definition
EPA	Rating of level of trust in United States Environmental Protection Agency: 1= do not trust at all; 2= distrust somewhat; 3= neither trust nor distrust; 4= trust somewhat; 5= trust completely; 6= respondent does not know about this agency
USDA	Rating of level of trust in United States' Department of Agriculture: 1= do not trust at all; 2= distrust somewhat; 3= neither trust nor distrust; 4= trust somewhat; 5= trust completely; 6= respondent does not know about this agency
LDEQ	Rating of level of trust in Louisiana Department of Environmental Quality: 1= do not trust at all; 2= distrust somewhat; 3= neither trust nor distrust; 4= trust somewhat; 5= trust completely; 6= respondent does not know about this agency
LOCGVT	Rating of level of trust in Local Government: 1= do not trust at all; 2= distrust somewhat; 3= neither trust nor distrust; 4= trust somewhat; 5= trust completely; 6= respondent does not know about this agency
LDAF	Rating of level of trust in Louisiana Department of Agriculture and Forestry: 1= do not trust at all; 2= distrust somewhat; 3= neither trust nor distrust; 4= trust somewhat; 5= trust completely; 6= respondent does not know about this agency
PCI	Rating of level of trust in Pest Control Industry: 1= do not trust at all; 2= distrust somewhat; 3= neither trust nor distrust; 4= trust somewhat; 5= trust completely; 6= respondent does not know about this agency
LSUAC	Rating of level of trust in LSU AgCenter and/or Louisiana Cooperative Extension Service County Agents: 1= do not trust at all; 2= distrust somewhat; 3= neither trust nor distrust; 4= trust somewhat; 5= trust completely; 6= respondent does not know about this agency

Table 3.6. Variable Definitions for Socio-Demography of Respondents

Variable	Definition
GENDER	Respondent's sex: 1= female; 0= male
AGE	Respondent's age in years
MARSTAT	Respondent's marital status: 1= never married; 2= divorced or separated 3= widowed; 4= married or living with partner
EDUCATION	Respondent's education level: 1= some high school or less; 2= high school graduate; 3= some college; 4= college graduate (B.A./B.S.); 5= graduate degree/professional degree (M.S./Ph.D./JD/MD)
INCOME	Respondent's annual family income: 1= under $20,000; 2=$20,000-$39,999; 3=$40,000-$59,999; 4= $60,000-$79,999; 5= $80,000-$99,999; 6=$100,000-$124,999; 7= $125,000-$149,999; 8=$150,000 or more
ETHNIC	Respondent's ethnic background: 1= Caucasian; 2= non-Caucasian (African-American, Indian, Eskimo, Asian or Pacific Islander, Hispanic, or other

3.3 The Survey Process

The survey process followed the "Total Design Method," proposed by Dillman (1978) to maximize the response rate of the mailed survey. To ensure clarity, appropriateness, and preciseness, the survey questionnaire was first pre-tested by focus group discussions with 20 homeowners in Ouachita Parish on September 6, 2002. The questionnaire was further pre-tested when mailed out to 400 randomly selected homeowners, 100 from each of the four metropolitan areas, on September 25, 2002. Feedback from both pre-tests was incorporated in the final version of the questionnaire.

A pre-notification letter was sent on November 5, 2002, one week prior to the first mailing, to inform the recipients of the survey. The first mailing of the survey along with cover letter and self-addressed postage-paid return envelope was mailed on November 12, 2002. A reminder postcard was mailed out to non-respondents on November 19, 2002, one week after the first mailing. The second mailing occurred on December 16, 2002, around five weeks after the first mailing. It included a follow-up letter and survey questionnaire. Copies of the cover letters,

pre-notification letter, and reminder postcard are presented in Appendix 3 through Appendix 7. Surveys postmarked after December 18, 2002 were classified as second mailing.

3.4 Survey Response Rate

The breakdown of the response rate by location is shown in Table 3.7. The overall response rate of the survey was 25%. The response rate was calculated by dividing the number of usable questionnaires received by the effective sample size of each location. Effective sample size means the remaining questionnaires after deducting undeliverable and non-homeowners from the original sample.

Table 3.7. Survey Response Rates from Each Metropolitan Area

	Metropolitan areas				
	Monroe	Alexandria	Baton Rouge	New Orleans	Total
Original sample Size	1,490	1,305	1,395	1,451	5,641
Effective sample Size	1,362	1,173	1,239	1,283	5,057
No. of first mailing	1,490	1,305	1,395	1,451	5,641
No. of second mailing	1,251	1,086	1,101	1,162	4,600
Usable surveys returned	314	271	355	299	1,239
Response Rate (%)	23	23	29	23	25

Questionnaires were mailed to 5,641 homeowners in Louisiana's major metropolitan areas: Monroe, Alexandria, Baton Rouge, and New Orleans. A total of 1,242 usable surveys was returned; 329 were undeliverable due to address changes and the other 255 respondents did not own the homes. Baton Rouge provided the highest response rate of 29%. New Orleans, Alexandria, and Monroe provided response rates of 23% each. Out of 52 French Quarter owners, 16 responded to the survey questionnaire. These responses were included within New Orleans responses because the post-hoc analysis indicated that means of 88% of the variables were not statistically different from the rest of the New Orleans responses.

3.5 Data Analysis

Most questions in the questionnaire were closed-ended. A codebook was developed to ease the data entry process. The data were entered into Microsoft's Excel spreadsheet program. The SAS computer program was used for data analysis. The accuracy of data entry was checked by frequency counts of each category and their maxima and minima. Descriptive statistics such as percentage, mean, median, maximum, and minimum were calculated by using SAS Analyst. Ordinary Least Square regression was used to model homeowner willingness to pay for termite control, and ordered PROBIT regression was used for contingent ranking.

CHAPTER 4: DESCRIPTIVE ANALYSIS

4.1 Demographics

Nearly 59% of the respondents were male, and 41% were female. The average age of respondents was 55 years, with the youngest 23 years and oldest 92 years old(Figure 4.1). Forty-three percent of respondents were between the ages of 50 and 69. Thirty-five percent and 19% of respondents, respectively, fell into the age categories of 30-49 years, and 70 years and above.

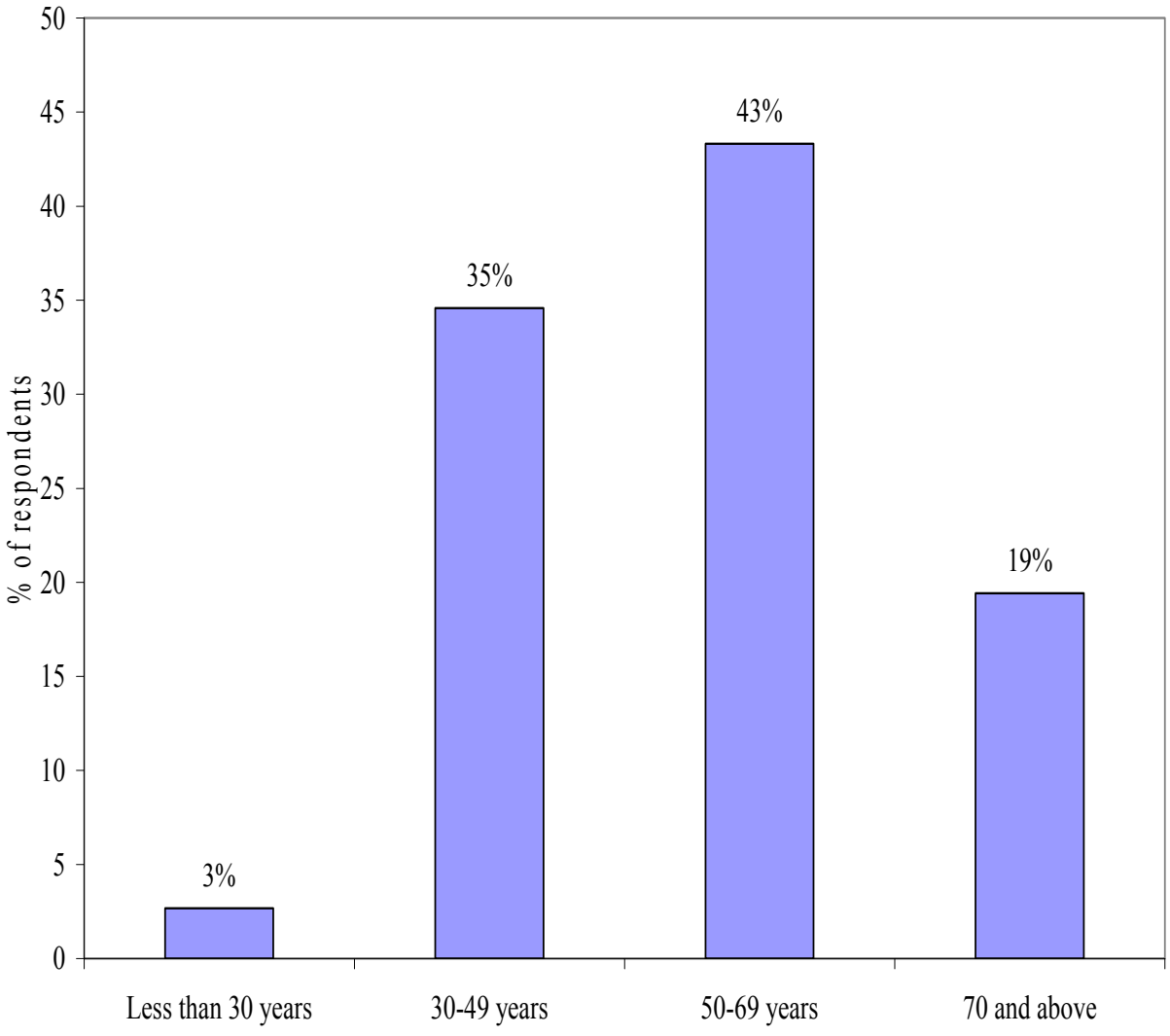


Figure 4.1. Respondent Age (n=1,122)

The majority of the respondents (70%) were married or living with a partner. Respondents who were never married, divorced or separated, and widowed, were 7%, 12%, and 11% respectively (Figure 4.2).

Respondents were well educated as three quarters (75%) had completed some college courses (29%), graduated from college (26%) or held a graduate degree (20%) (Figure 4.3). Only 4% of respondents had an education level of some high school or less. The other 21% of respondents were high school graduates.

When asked about annual pre-tax household income, 1,015 respondents provided us with information (Figure 4.4). Approximately 13% of respondents had annual pre-tax household incomes less than $20,000. Nearly 68% of respondents had annual pre-tax household incomes more than $20,000 and less than $100,000. The balance of respondents had annual pre-tax household incomes of more than $100,000 (19%).

The vast majority (79%) of respondents were Caucasians (Figure 4.5). Approximately 17% of the respondents were African American and the remaining, 4% were Asian or Pacific Islander, Native American, Hispanic, and others.

4.2 Respondent Homes and Homeownership Information

4.2.1 Type of Home Ownership

With regard respondents' home type, 1,235 respondents provided information (Figure 4.6). The vast majority of respondents (91%) indicated that they lived in a single-family dwelling. Another 7% indicated they lived in multiple-family dwellings.

4.2.2 Length of Homeownership

When asked about their length of homeownership, 1,240 respondents provided information (Figure 4.7). The majority of respondents (59%) indicated that they had owned their

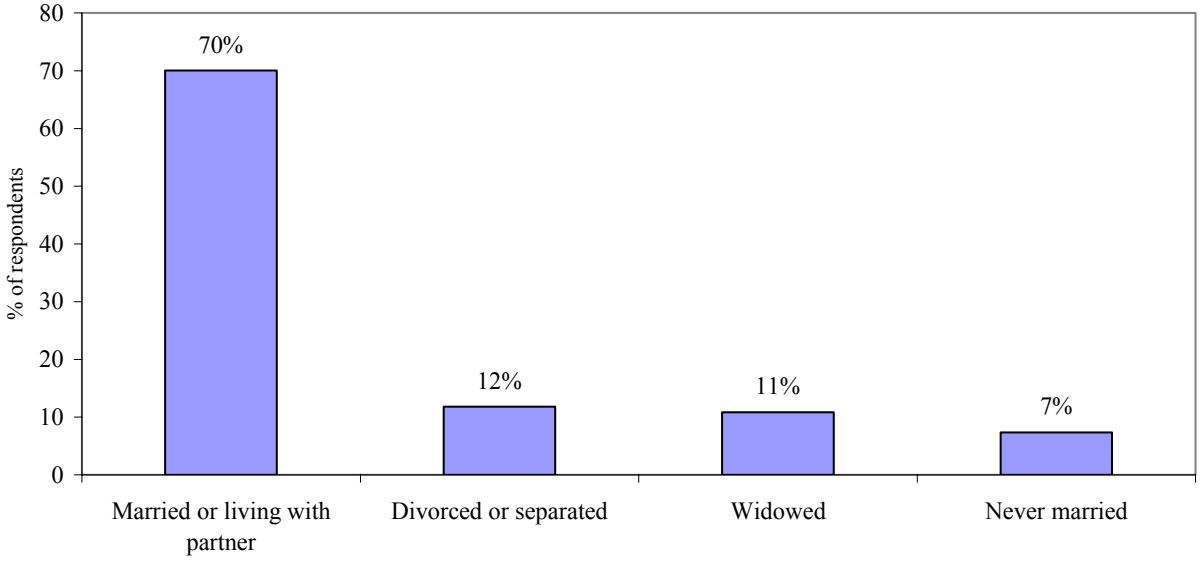


Figure 4.2. Respondent Marital Status (n=1,154)

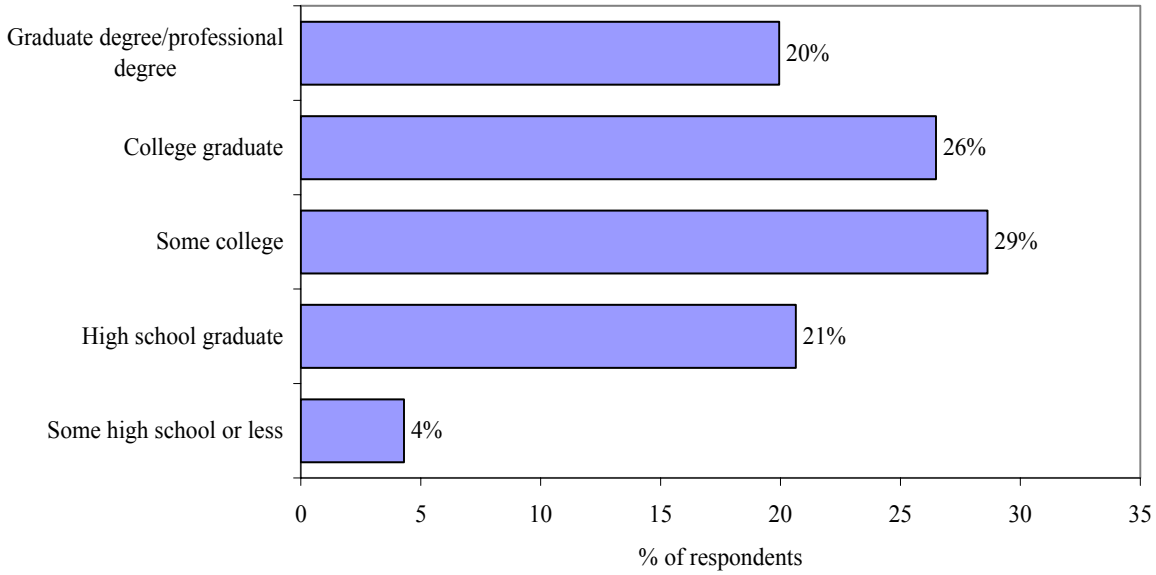


Figure 4.3. Education Level (n=1,163)

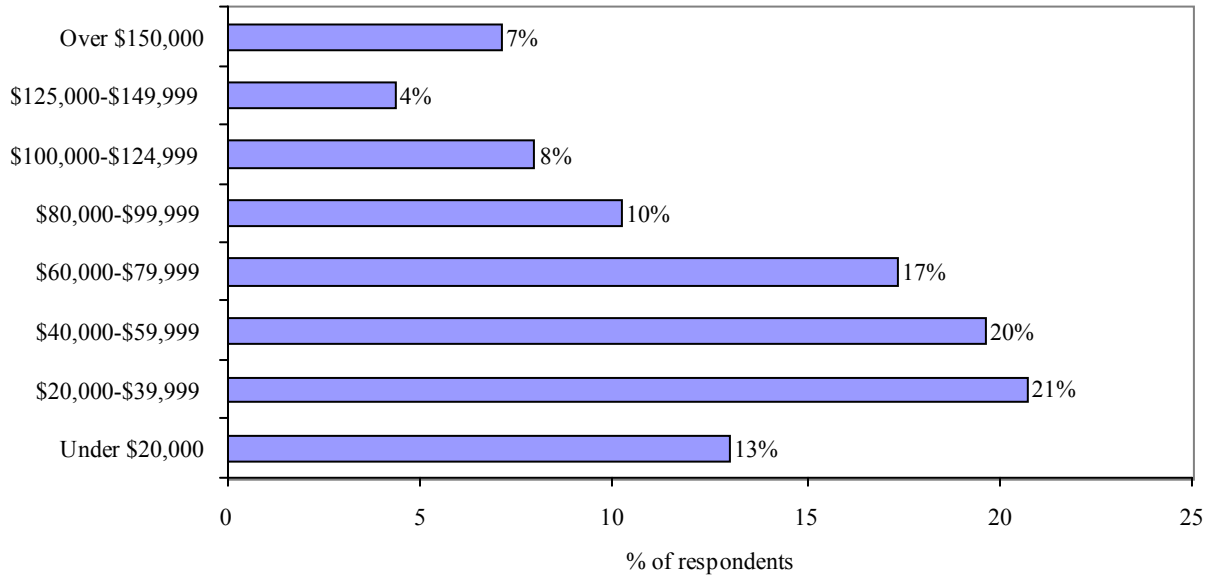


Figure 4.4. Annual Pre-tax Household Income (n=1,015)

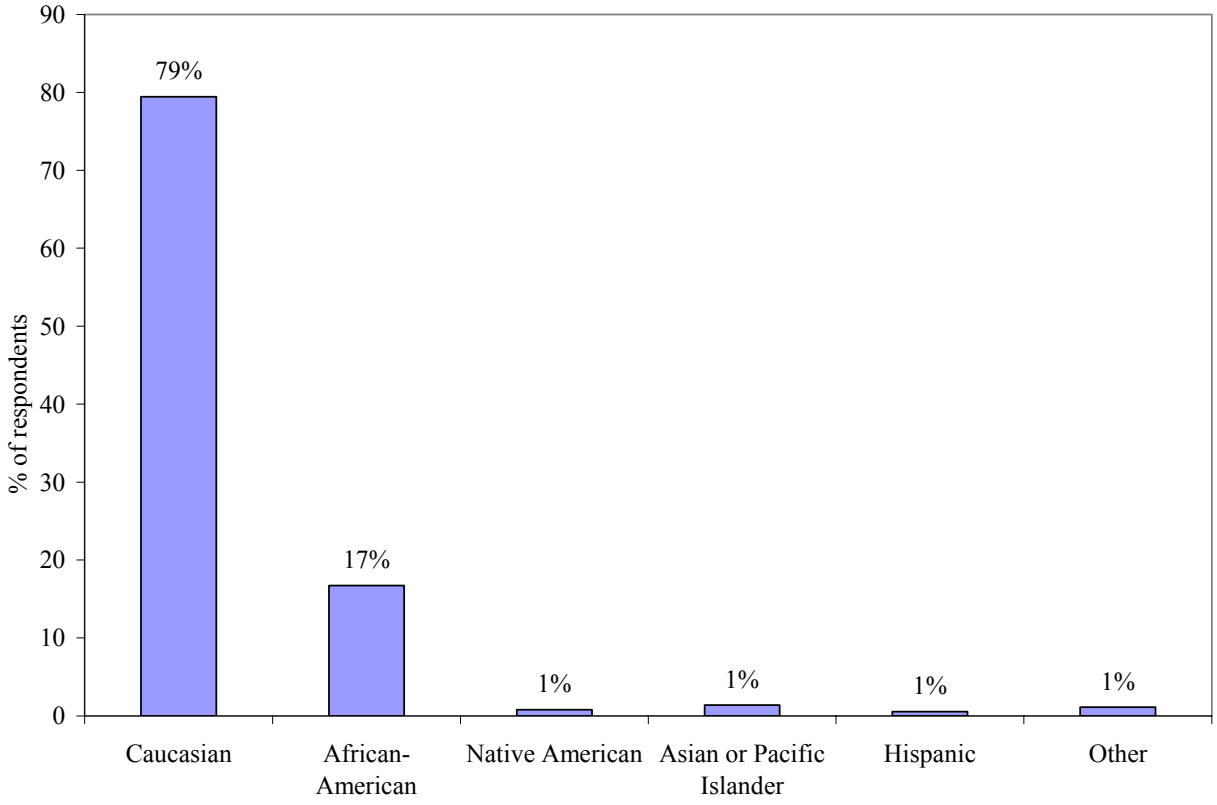


Figure 4.5. Ethnicity (n=1,147)

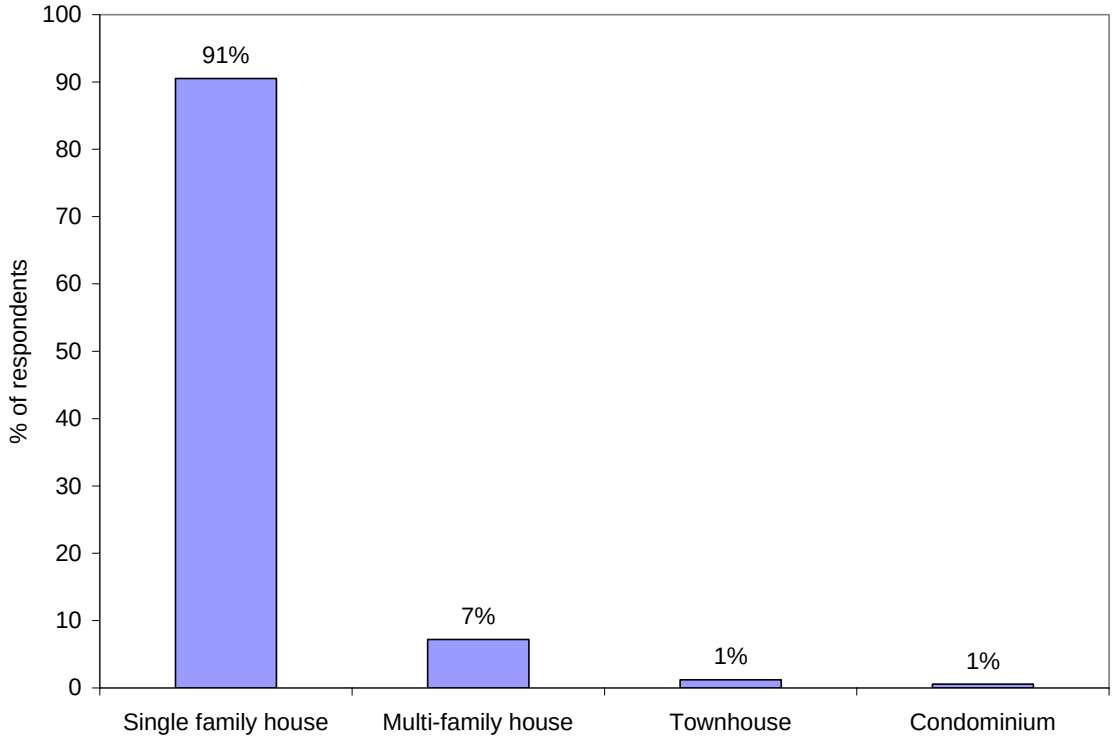


Figure 4.6. Description of Types of Houses Inhabited (n=1,235)

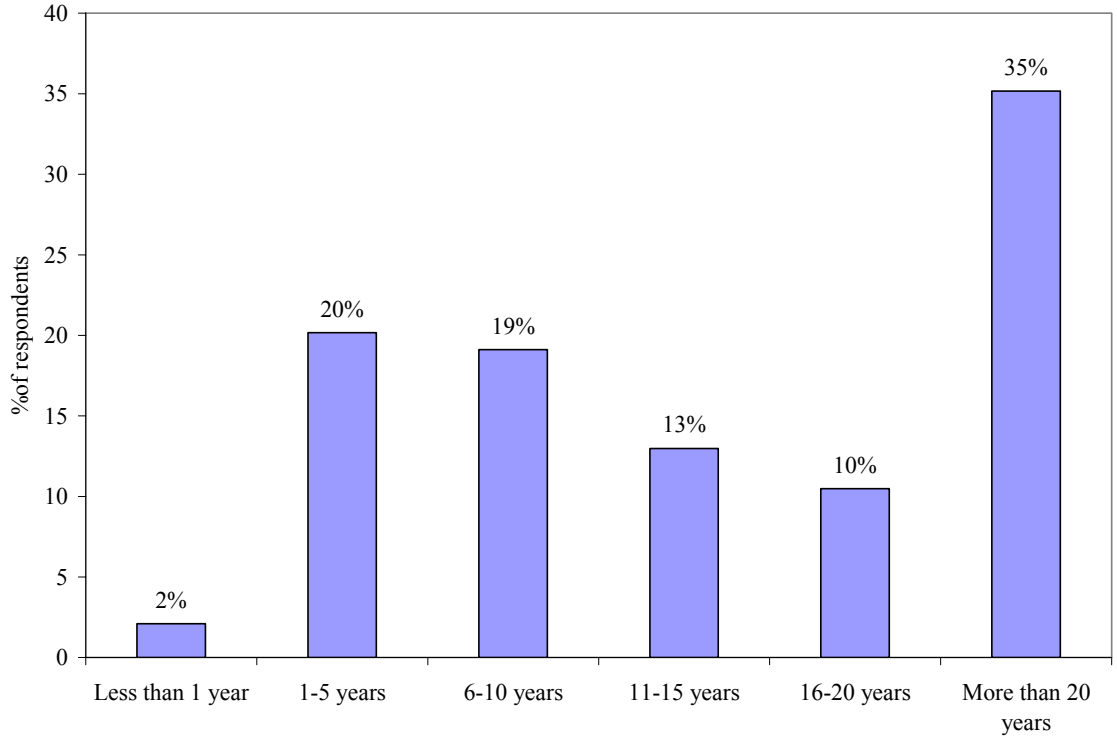


Figure 4.7. Length of Home Ownership (n=1,240)

current home for more than 10 years, which also included 35% of respondents who owned their current home for more than 20 years. Only 22% of respondents indicated that they had owned their home for less than five years. Cross-tabulated results showed that the length of ownership was not associated with location.

4.2.3 Living Space of Home

A total of 1,210 respondents provided information about their homes' living space (Figure 4.8). Most respondents (67%) indicated that their home living space fell in the 1,500 to 3,000 square feet category. Only 14.5% respondents had bigger homes, with a living space of more than 3,000 square feet. By cross-tabulating the living space with location, it was found that higher percentages of New Orleans (19%) and Baton Rouge (15%) respondents had home living space of more than 3,000 square feet as compared to respondents from Monroe (12%) and Alexandria (11%).

4.2.4 Garage

Out of 1,232 respondents, 51% indicated that they had a garage. Location wise, 60%, 53%, 48%, and 43% of Monroe, Alexandria, Baton Rouge, and New Orleans respondents, respectively, had garages.

4.2.5 Estimated Market Value of Home

Each homeowner was asked to estimate the home's market value. Nearly 72% of respondents estimated their home to be worth between $50,000 and $200,000 (Figure 4.9). Only 8% of respondents estimated their home value to be less than $50,000 and 20% estimated their home value to be more than $200,000.

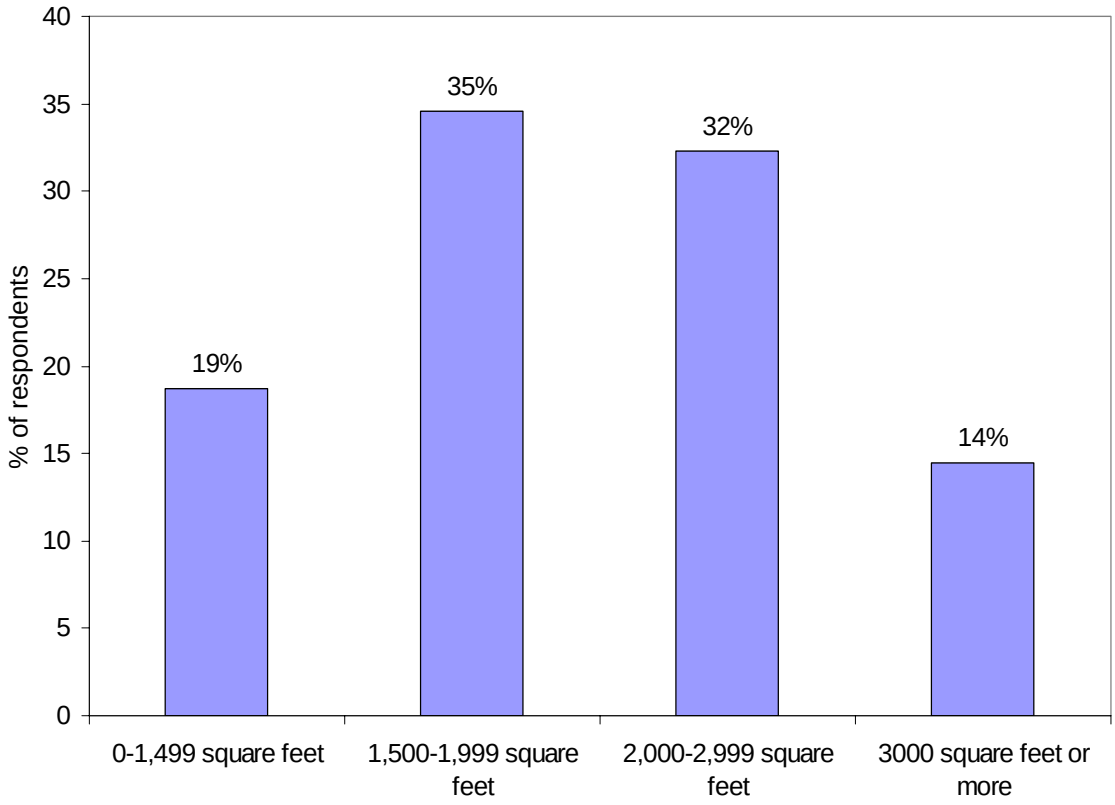


Figure 4.8. Living Space Categories (n=1,210)

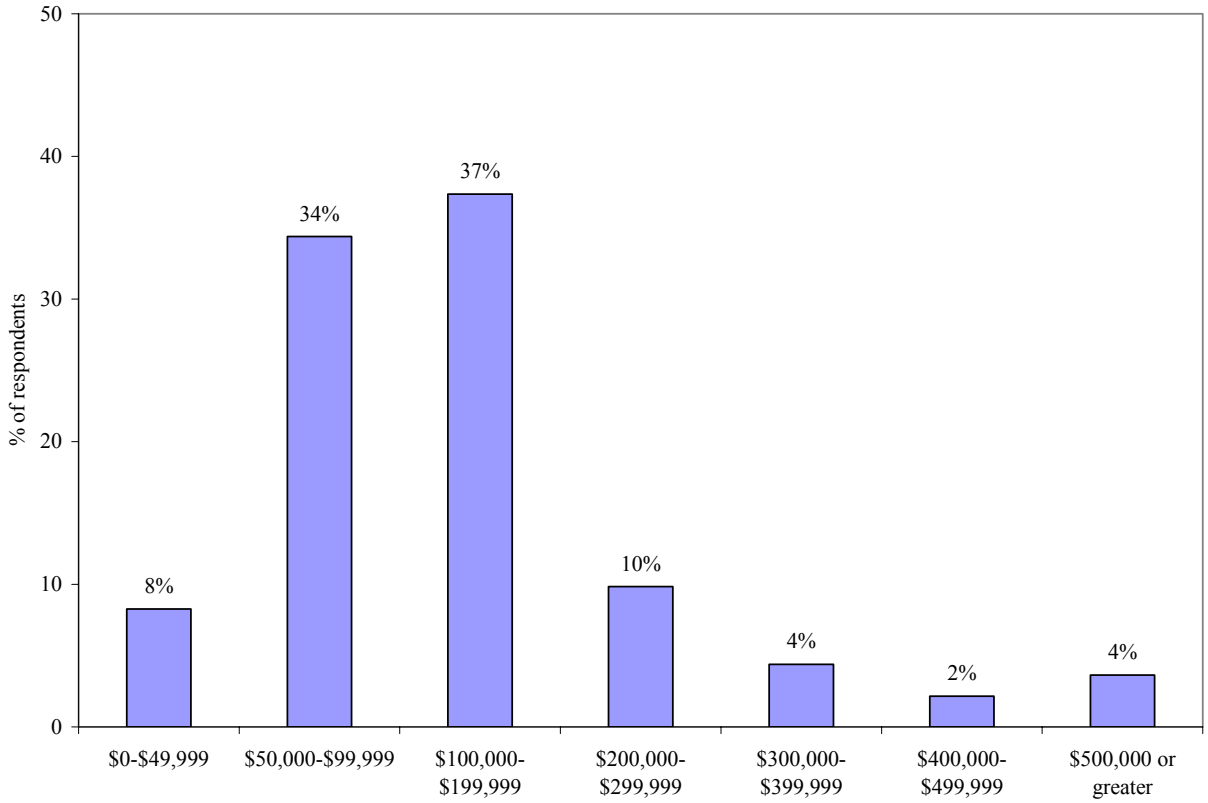


Figure 4.9. Homeowners' Estimates of Market Value of Their Homes (n=1,210)

When cross-tabulating was analyzed for the estimated market value with geographic location, there existed a strong association. For example, 34% of New Orleans respondents estimated their home value to be more than $200,000. Only 21% of Baton Rouge respondents estimated their home market value to be more than $200,000, while even fewer (12%) of respondents from Monroe and Alexandria reported their home value to be more than $200,000.

4.2.6 Home Construction

When asked about their home's construction type, a majority of respondents (75%) indicated that their houses were constructed of wood frame with non-wood siding, while 16% respondents indicated their houses were built of wood frame with solid wood siding (Figure 4.10). The remaining 10% of respondents reported their houses were either concrete block construction (3%), trailer home (3%), pre-fabricated manufactured home (1%), steel frame (1%), or other materials (1%).

4.2.7 Mortgage on Home

The majority of respondents (58%) had a mortgage on their homes and 658 of them provided information regarding the length of the mortgage (Figure 4.11). Nearly 54% of respondents with a mortgage reported the length of mortgage to be 30 or more years, whereas 28% had a mortgage of between 15 and 20 years. A total of 595 respondents reported that they still needed to pay off their mortgage.

4.2.8 Plans for Selling Their Home

Respondents were asked whether they had plans to sell their homes at any point in future. A majority of the respondents (68%) indicated that they did not have any plans for selling their homes while 33% of respondents reported that they planned to sell. The majority of the

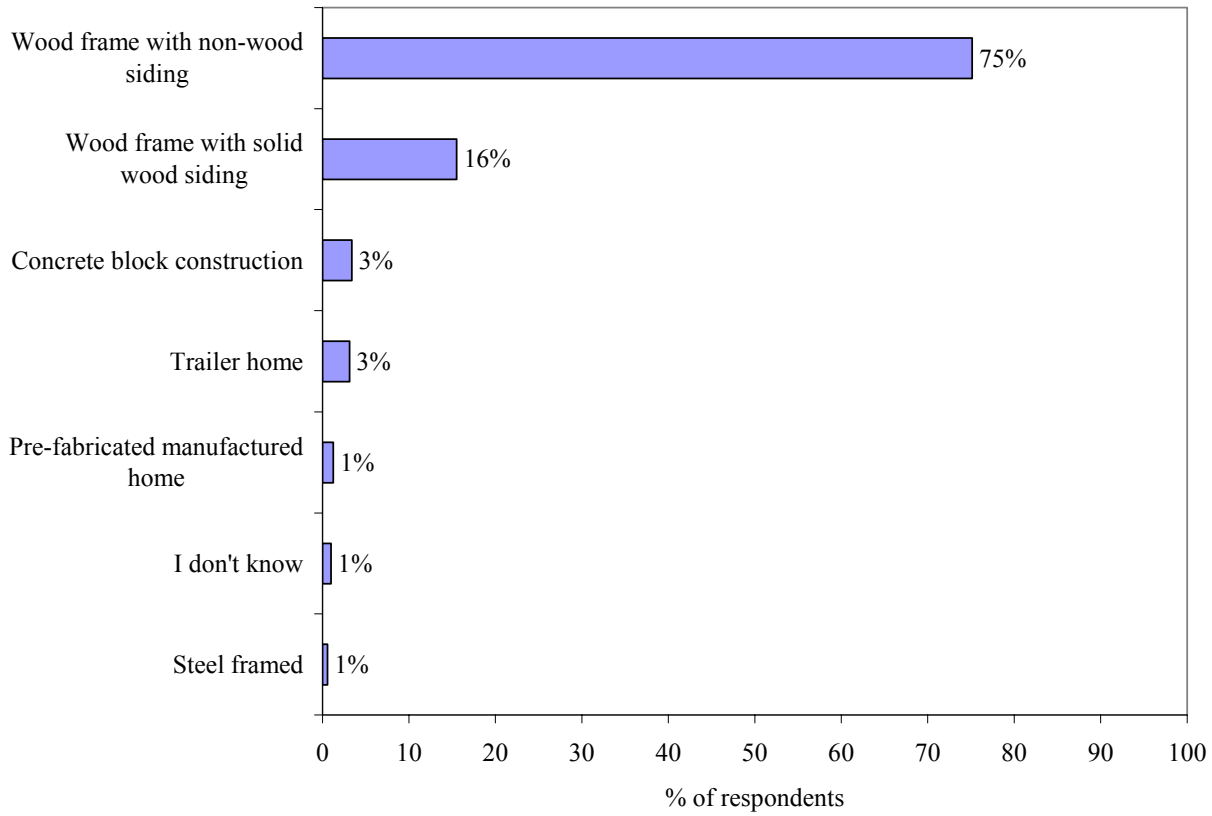


Figure 4.10. Types of Home Construction (n=1,215)

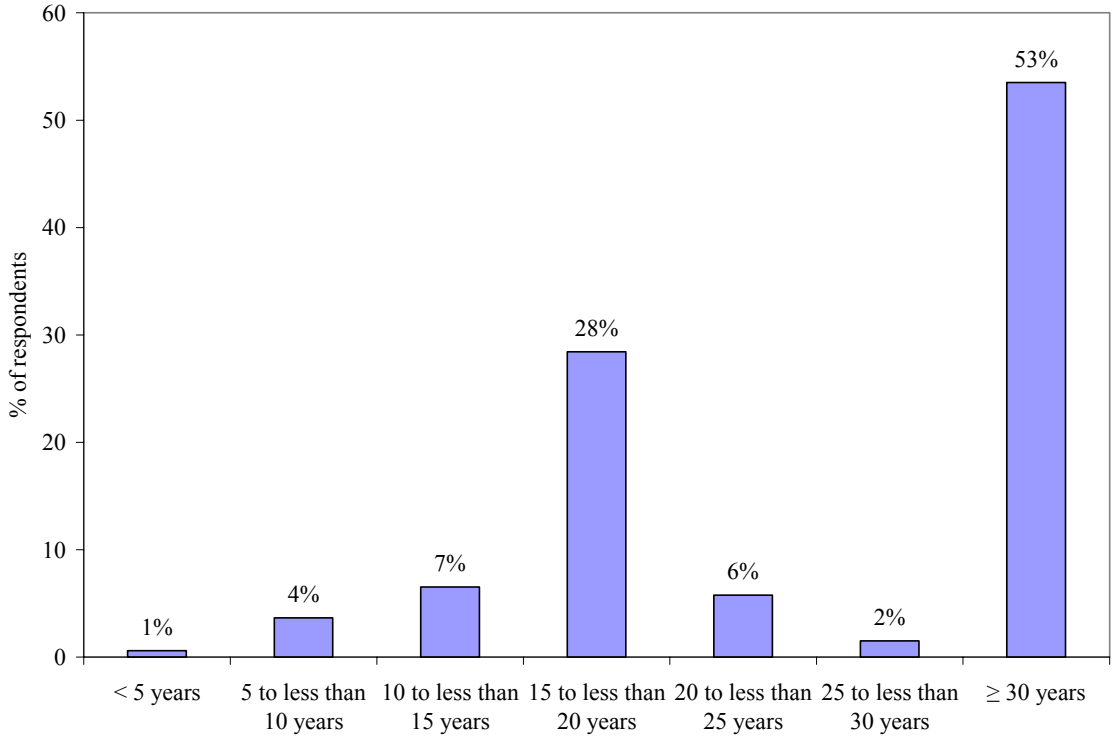


Figure 4.11. Length of Mortgage on Home (n=658)

respondents who plan to sell their home (81%) indicated their inclination to sell it after two years (Figure 4.12).

Most respondents wanted to sell their homes due either to anticipated retirement (36%), their expectation that their children will be leaving the home or finding new jobs (6%), because of high taxes (3%), other reasons (53%) (Figure 4.13). The 'Other' category of reasons for selling their homes is presented in Appendix 7.

4.3 Respondents' Knowledge of Termites

4.3.1 Termites Found in Respondents' Homes

Thirty-nine percent of respondents encountered termites in their homes while either they owned the home or when it was under previous ownership. Seventy-eight percent of respondents who stated that their homes had experienced a termite invasion were the current homeowners. Demographically, New Orleans was the most affected by termites, where 61% (n=183) of respondents reported that termites had been found in their homes. Baton Rouge was second with 38% of respondents indicating that termites had been found in their homes (Figure 4.14). Similarly, 30% and 28% of Monroe and Alexandria respondents, respectively, indicated they found termites in their homes.

4.3.2 Damage Caused by Termites

Homeowners were asked to estimate the dollar amount of damage caused by termites if the termites had infested their houses. Only 378 respondents provided information on monetary terms regarding damage. While a majority of respondents (65%) estimated termite damage to be less than $2,500, about 12% of respondents estimated damage between $2,500 and $4,999. Only 18 (4.8%) respondents indicated termite damage between $5,000 and 7,500. A few respondents

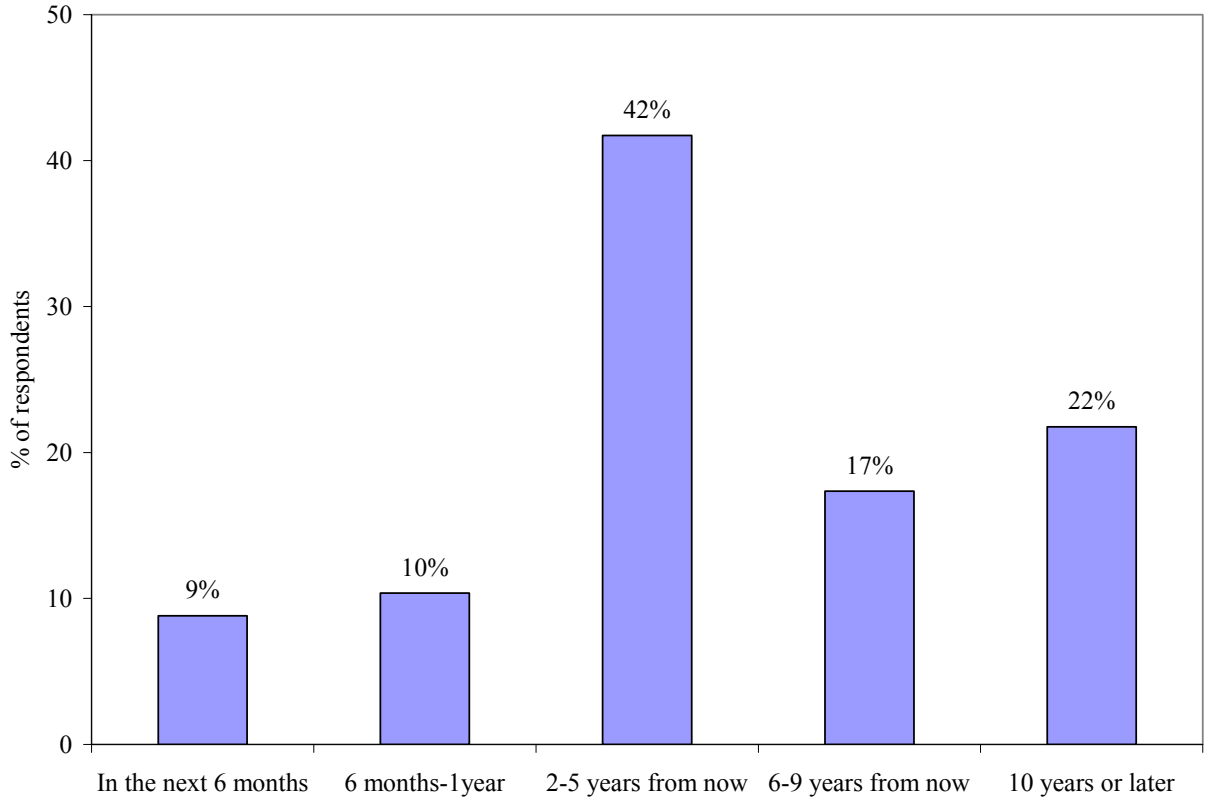
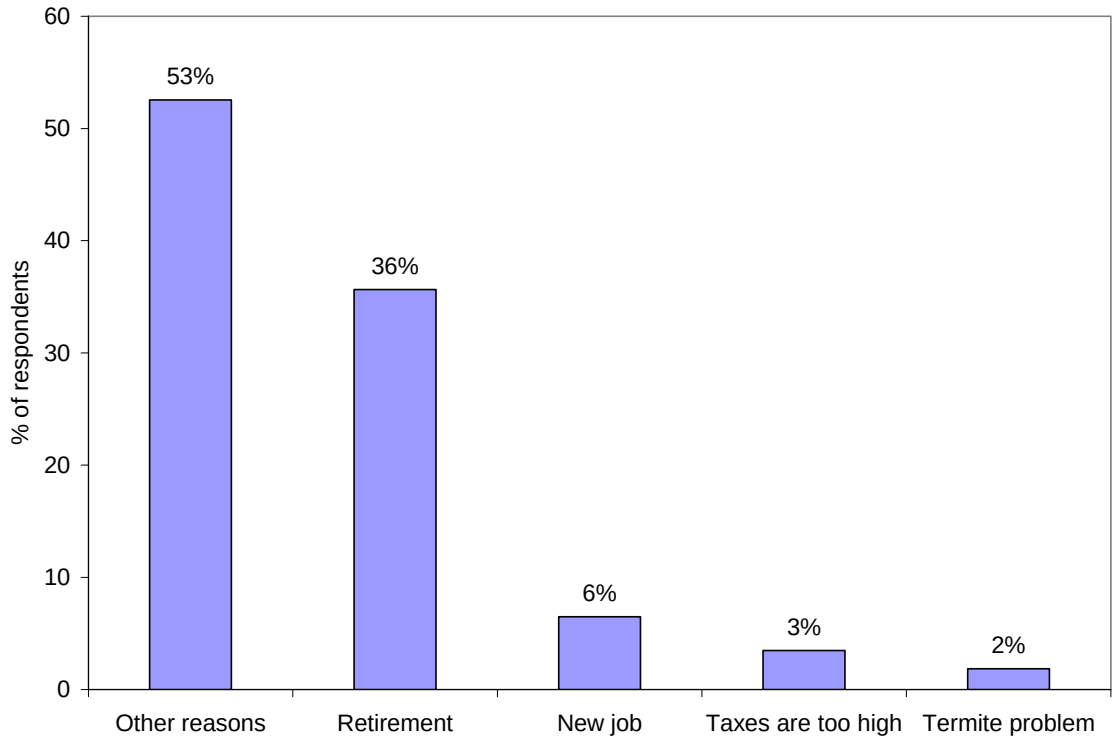


Figure 4.12. Homeowners' Plan to Sell their Home in Future (n=1,210)



(Multiple responses possible)

Figure 4.13. Reasons Homeowners Plan on Selling their Homes (n=432)

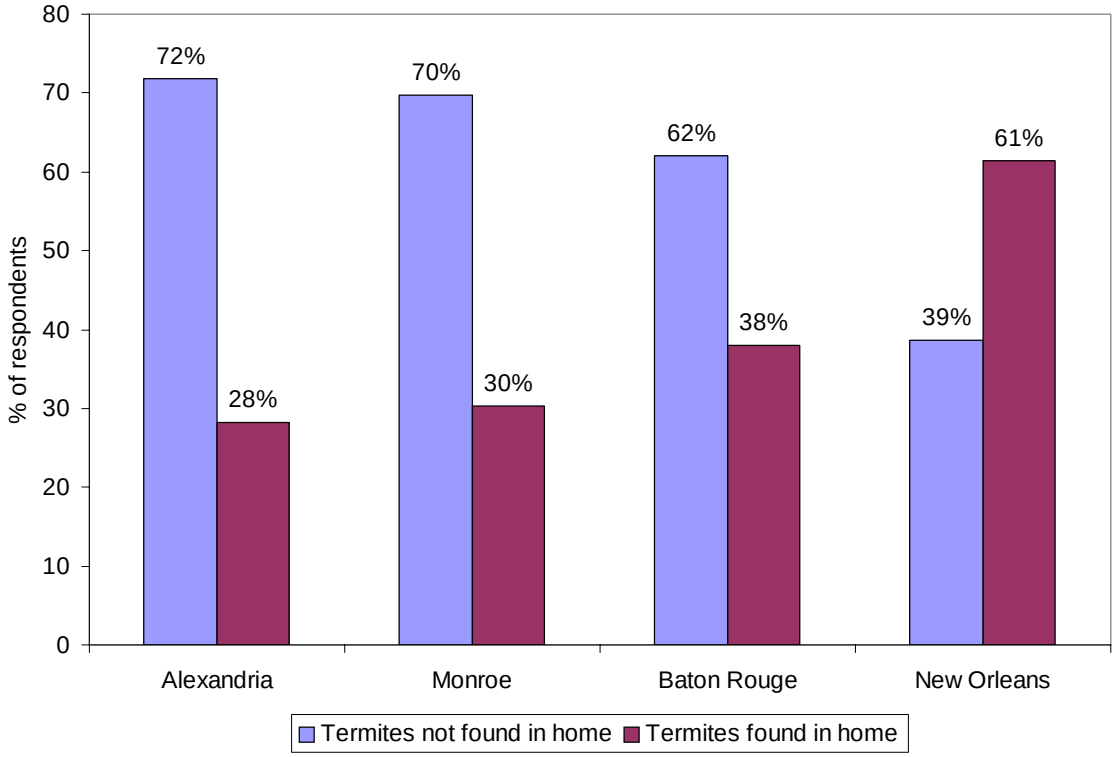


Figure 4.14. Termite Infestation Incidences Cross-Tabulated by Location (n=1,232)

(n=6) estimated home damage caused by termites was more than $20,000. The remaining 12% of respondents did not know the cost of the damage caused by termites (Figure 4.15).

4.3.3 Damage Cost Payment

Seventy-one percent of respondents (n=242) who purchased a termite prevention contract stated that the damage incurred was paid for by homeowners, out of their own pockets. Only 18% of respondents indicated that the cost of the damage was covered by a termite protection warranty. The other 11% of respondents did not know who bore the damage cost (Figure 4.16).

4.3.4 Types of Termite Infestation

If termites had infested their homes, respondents were asked about the type of termite infestation in their homes. A large number (45%) of respondents did not know what type of termite had infested their home. Approximately 32% of respondents reported their homes to be infested by Native Subterranean Termites, whereas 13% and 7% reported Formosan Subterranean Termite and Drywood Termites, respectively. The remaining 3% of respondents indicated that their homes were infested by more than one kind of termite (Figure 4.17).

4.3.5 Perceptions Regarding Termite Problems

Homeowners were asked whether or not they considered termites to be an existing problem in their neighborhood. Twenty-five percent of respondents did not consider termites to be an existing problem in their neighborhood, whereas 47% of respondents considered that they were. It was hypothesized that homeowners considering termites to be an existing problem were willing to pay more for termite control. A sizable percentage (29%) lacked knowledge about termites (Figure 4.18).

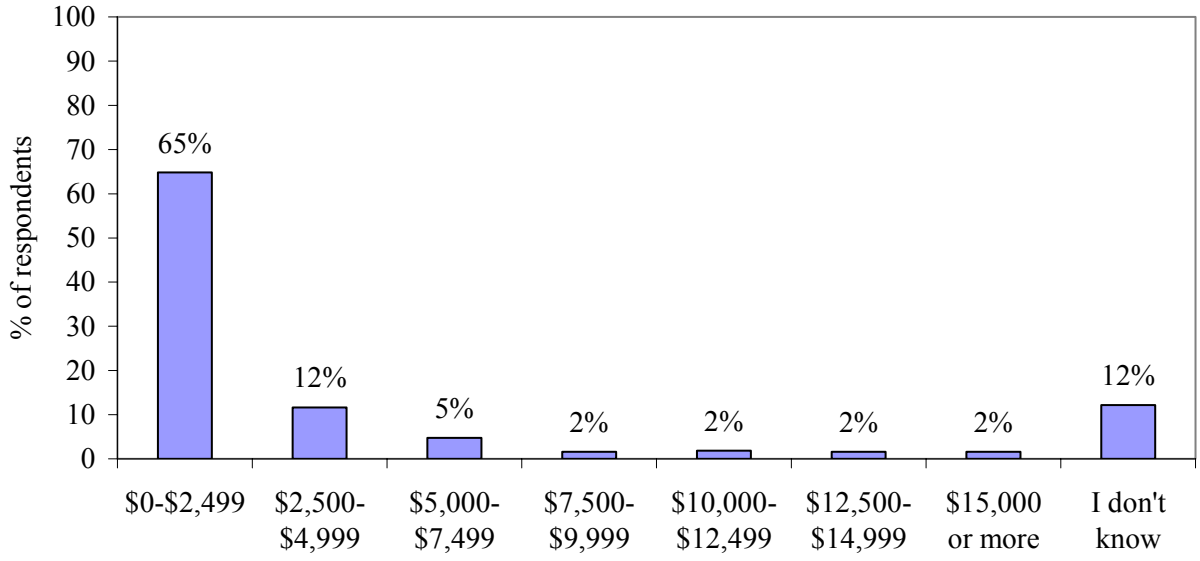


Figure 4.15. Estimated Home Damage Caused by Termites (n=378)

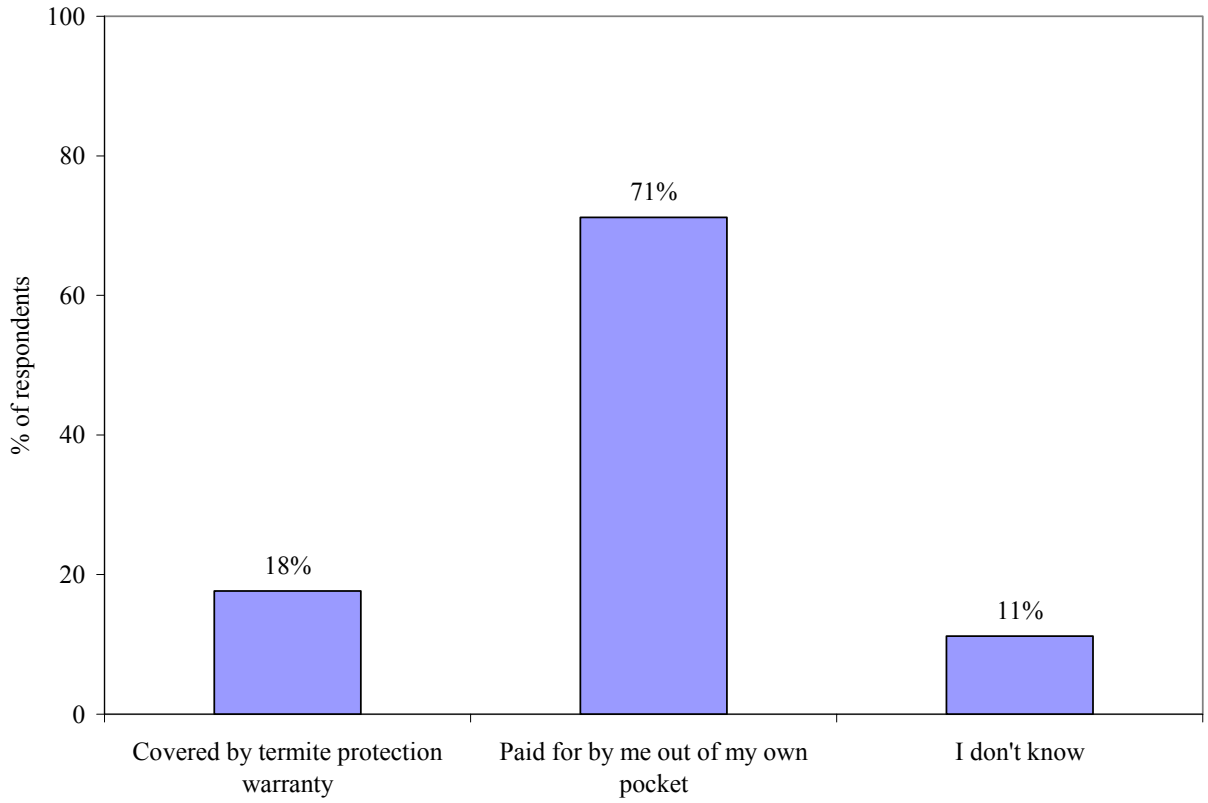


Figure 4.16. Termite Damage Coverage: Sources (n=340)

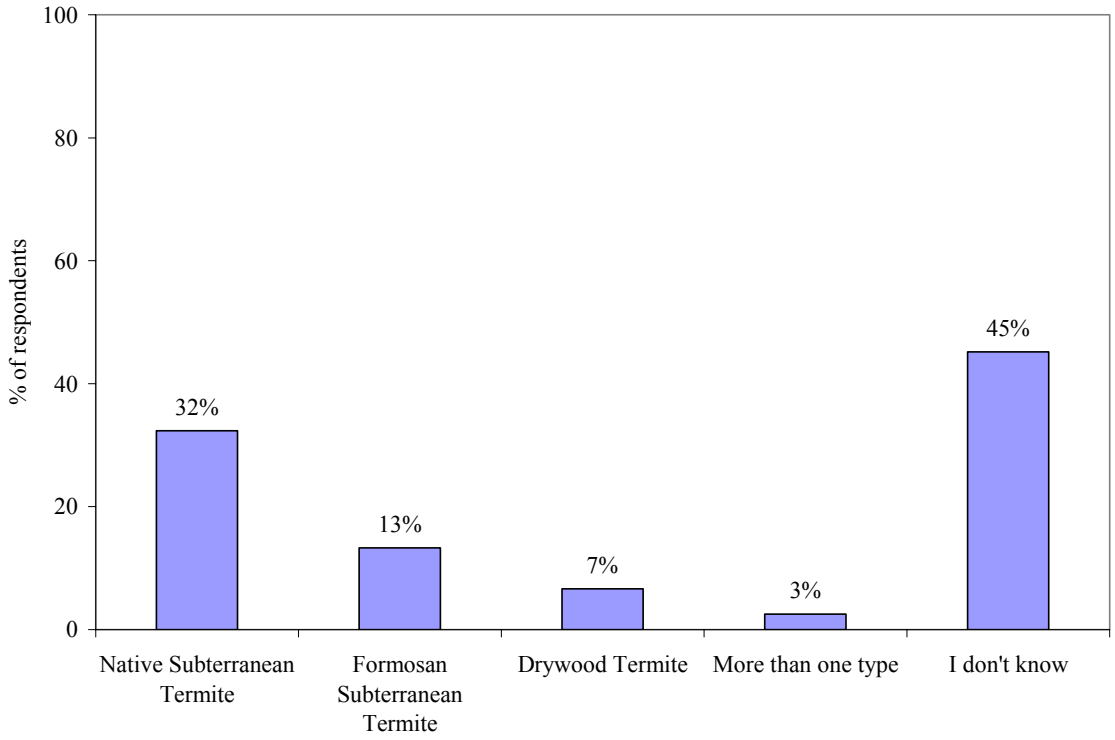


Figure 4.17. Types of Termite Infestation (n=436)

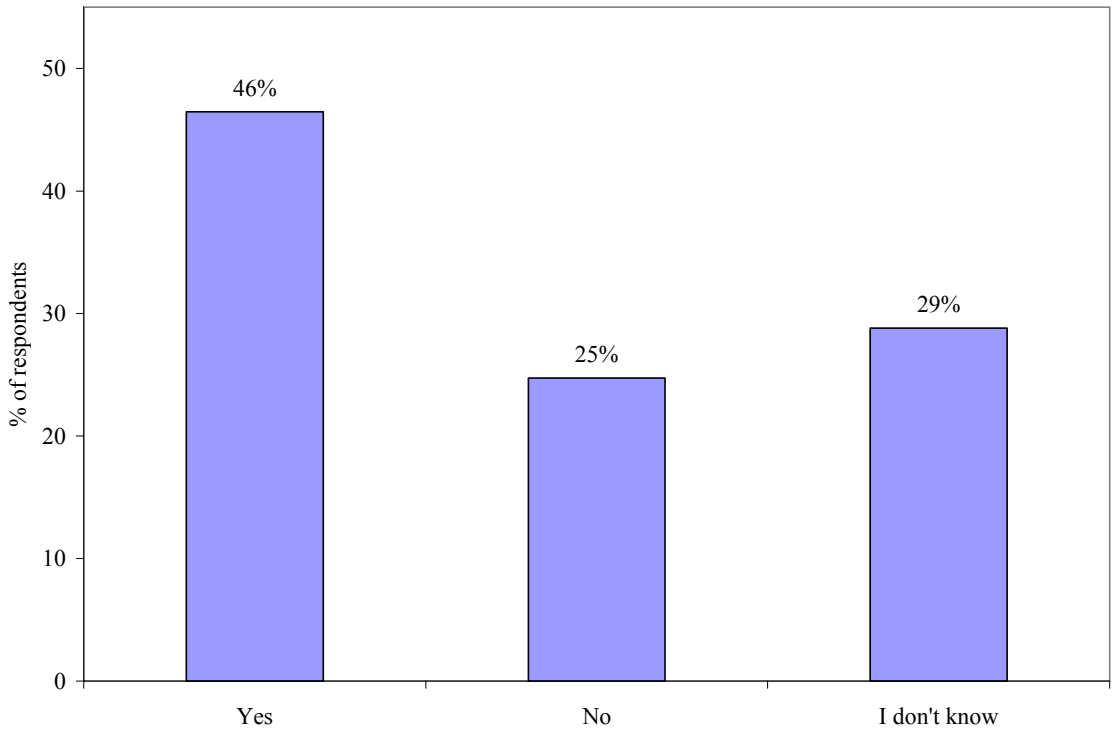


Figure 4.18. "Do You Consider Termites to Be an Existing Problem in Your Neighborhood?" (n=1,205)

4.3.6 Termite Prevention/Control Contract

Respondents were asked whether or not they currently have a termite prevention/control contract with a pest control operator. Forty-seven percent of respondents indicated that they had a contract. The remaining 53% of respondents did not have contract but 86 (7%) intended to purchase one within the next year. Location-wise, 59%, 53%, 39%, and 34% of respondents from New Orleans, Baton Rouge, Monroe, and Alexandria, respectively, had a termite control contract. The percentage of respondents who considered termites to be an existing problem is highly correlated with the percentage of respondents who had purchased termite control contracts.

4.3.6.1 Initial Installation Fee

More than 37% of respondents with termite contracts paid initial installation fees of less than $400. Another 22% of respondents paid between $401-800, and 17% paid more than $800. This fee is usually applied at the start of the service period. Approximately 24% of respondents did not know how much the installation fee was (Figure 4.19).

4.3.6.2 Annual Renewal Fee

Approximately 42% of respondents with termite control contracts were paying annual renewal fees of less than $100. An additional 37% of respondents were paying $100-199, 8.2% were paying $200-299, and 4% were paying $300-399. Approximately 2% were paying at least $400 for an annual renewal fee and 7% of respondents did not know how much the renewal fee was (Figure 4.20).

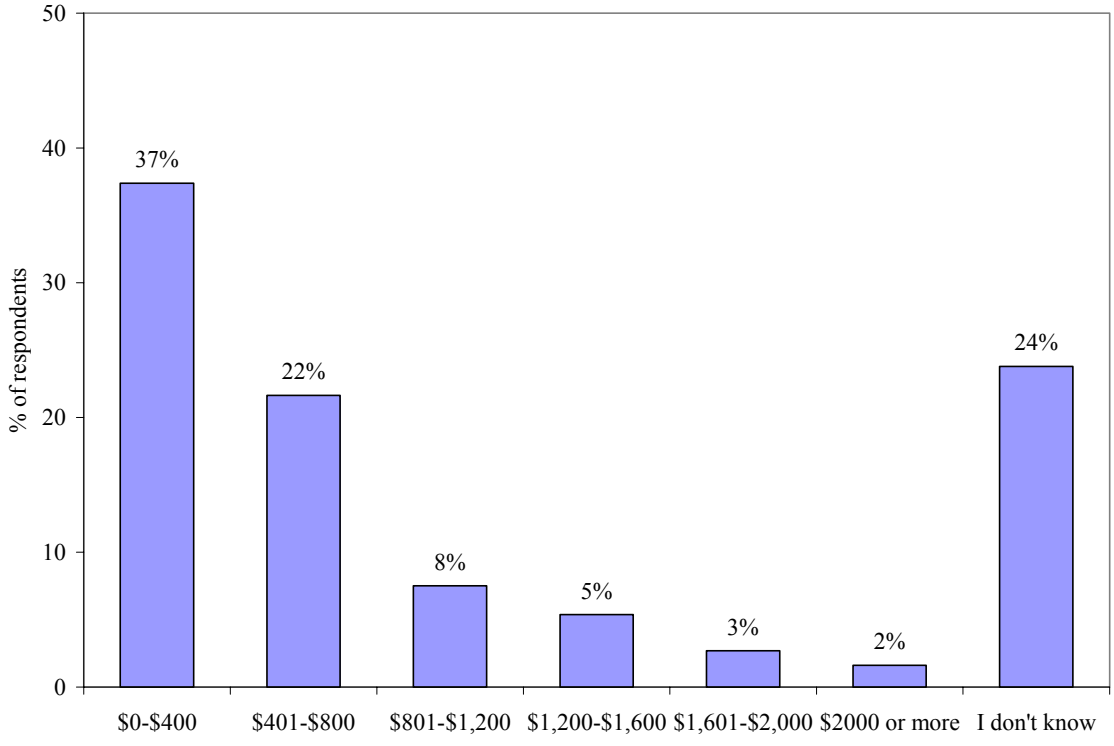


Figure 4.19. Estimation of Initial Installation Fee (n=553)

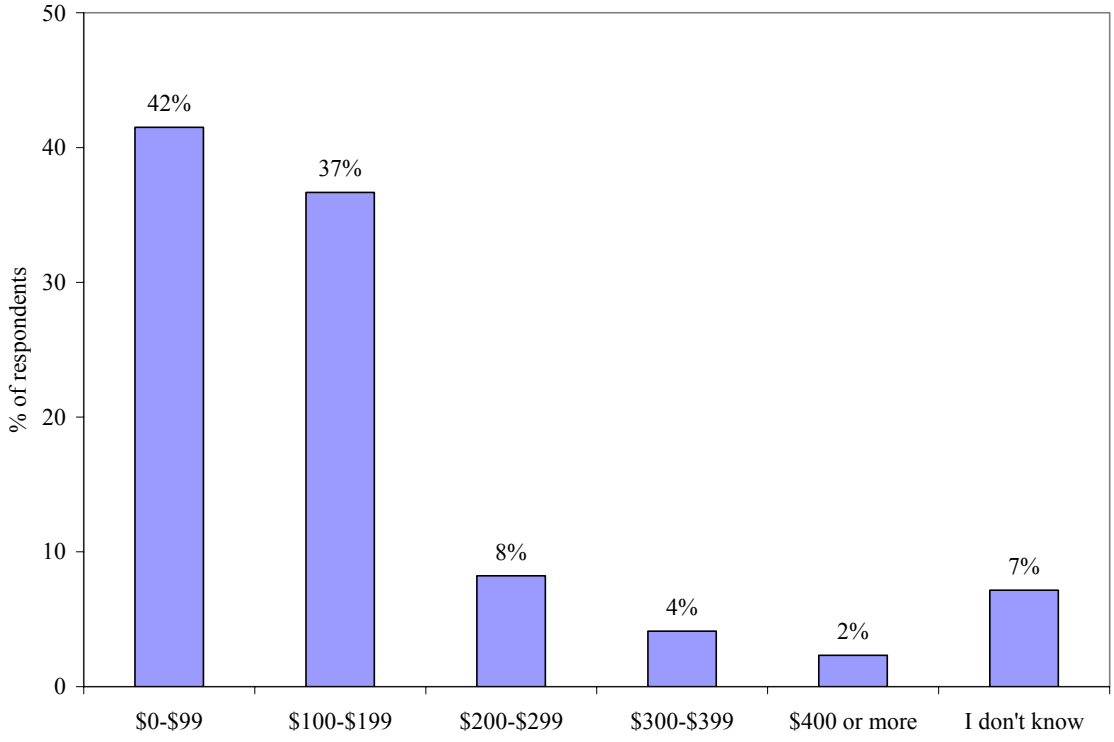


Figure 4.20. Homeowners' Estimate of Annual Renewal Fee (n=553)

4.3.6.3 Warranty Coverage

Respondents were asked about their termite control contract warranty coverage. A total of 552 respondents provided this information (Figure 4.21). The 47% of respondents with termite contracts stated that the coverage was for both re-treatment and payment for damage, whereas 28% of respondents stated that their contract covered re-treatment only. Twenty-five percent of respondents did not know about their contract coverage.

4.3.7 Respondents' Awareness of the FST

Respondents were asked if they had ever heard of the FST. The majority of respondents (75%; n=1,225) had heard of the Formosan Subterranean Termite. Approximately 89%, 83%, 68%, and 54% of respondents in New Orleans, Baton Rouge, Monroe, and Alexandria, respectively, had heard of the FST. Respondents were further asked about sources from which they had heard about the FST. They indicated that their main source of information was either television (29%), newspaper (25%), pest control service (15%), friends (11%), radio (10%), government (3%), extension service (3%), or other sources (3%) (Figure 4.22).

4.4 Cross-Reference Analysis

Descriptive results shown in Section 4.3 do not fully explain the underlying reasons for respondent responses. Accordingly, important variables are cross-referenced to draw some additional conclusions.

4.4.1 Termites Found in the Home

As stated earlier, more than 39% of respondents indicated that they had found termites in their homes. The occurrence of termite infestation could be associated with a number of factors (Table 4.1).

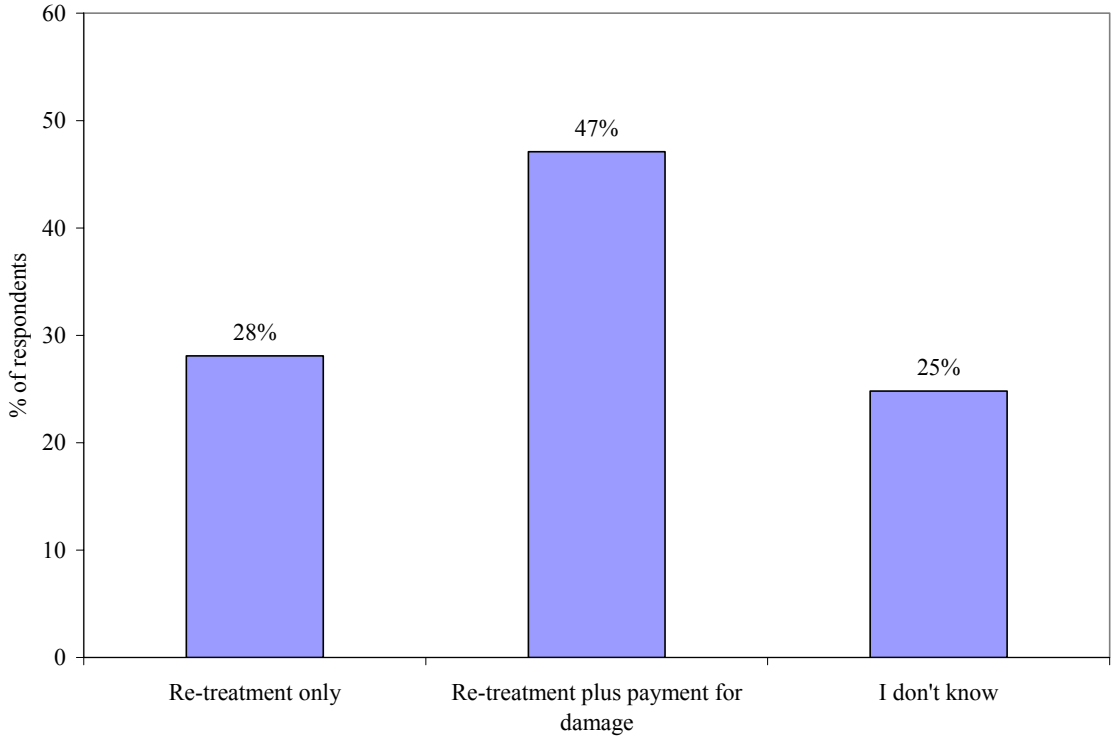


Figure 4.21. Warranty Coverage by Termite Prevention Contract (n=552)

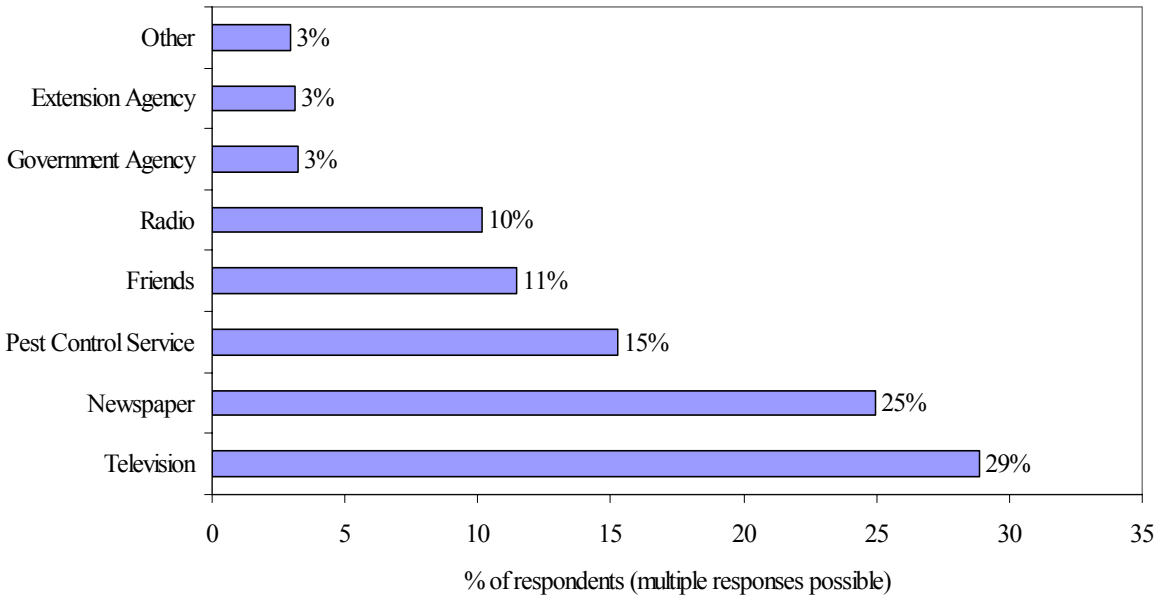


Figure 4.22. Where Respondents Have Heard of the FST (n=2,350)

We failed to reject the null hypothesis of no association between termite infestation by location, home type, types of home construction, whether or not respondents consider termites to be an existing problem in their neighborhood, whether or not respondents have a termite control contract, whether or not respondents have heard of the FST, income, and ethnicity. Respondents' future plans for selling their homes were not correlated with termite infestation. These variables were significant at the 5% level. Chi-square was applied to test whether there was association between two variables.

Table 4.1. A Summary of Chi-square Tests for Termite Infestation Cross-Referenced with Other Variables

Variables	Observations	DF	Chi-square	Probability
Termite infestation by:				
Location	1,232	3	85.9	0.0001
Which best describes the house you own where you received this survey?	1,228	4	13.2	0.0104
How would you best describe your home's construction?	1,209	7	34	0.0001
How would you describe your home's foundation?	1,190	1	28.9	0.0001
Do you plan to sell your home at any point in the future?	1,204	1	0.4	0.5174
Do you currently have a termite prevention/control contract?	1,210	1	64.8	0.0001
Have you ever heard of the Formosan Subterranean Termite?	1,219	1	7.5	0.0059
What is your estimated total annual pretax household income?	1,017	7	18.1	0.0115
What is your ethic group?	1,141	5	14.6	0.0124

A Chi-square test suggested that termite infestation was strongly associated with location. New Orleans had the highest proportion of respondents who had found termites in their homes (61%), followed by Baton Rouge (38%), Monroe (30%), and Alexandria (28%) (Figure 4.23).

Termite infestation was also associated with home type at the 5% level of significance. The proportion of respondents who had termite infestations was lower for single-family dwellings (38%) than for other types of dwellings (53%).

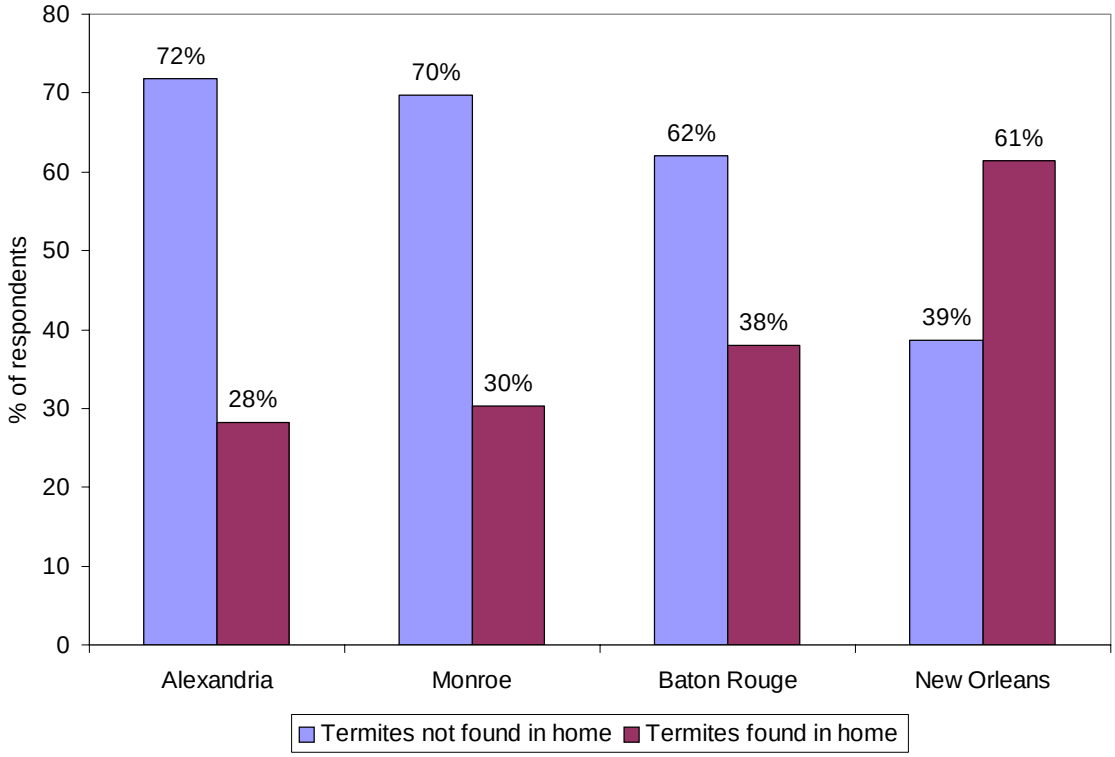


Figure 4.23. Termite Infestation Incidences Cross-Tabulated by Location (n=1,232)

Types of home construction were significantly associated with whether or not termites had been found in the homes (Figure 4.24). A higher proportion of wood frame homes with solid wood siding had termites (56%) than wood frame homes with non-wood siding (37%). Only 29% of respondents owning other types of structures reported that they had found termites in their homes.

Chi-square results indicate that termite infestation occurrences are significantly associated with home foundation type. Thirty-four percent of respondents whose homes have concrete slab foundations indicated they had found termites in their homes, whereas 50% of respondents with raised construction home foundations indicated they had found termites in their homes (Figure 4.25). This suggests that termite infestation is less likely in a home with a concrete slab foundation than in a home with a raised construction foundation.

Likewise, termite infestation was also associated with the purchase of a termite control contract. Only 29% of respondents with termite infestations did not have a termite control contract, whereas more than 51% respondents with termite infestations had such a contract. Although the argument might be weak, income and ethnicity of respondents were significantly associated with termite infestation occurrences. It was found that the higher the respondent's income, the higher the termite infestation rate.

Termite infestation occurrences were associated with ethnicity. Termites were more likely to be found in the homes of non-Caucasians than Caucasians. Only 38% of Caucasians found termites in their homes compared to 46% of non-Caucasians.

4.4.2 Attitudes About Termite Problems in Homeowners' Neighborhoods

Termite problems in homeowner neighborhoods could differ by location, whether or not termites have been found in the respondent's home, home construction type, market value, length

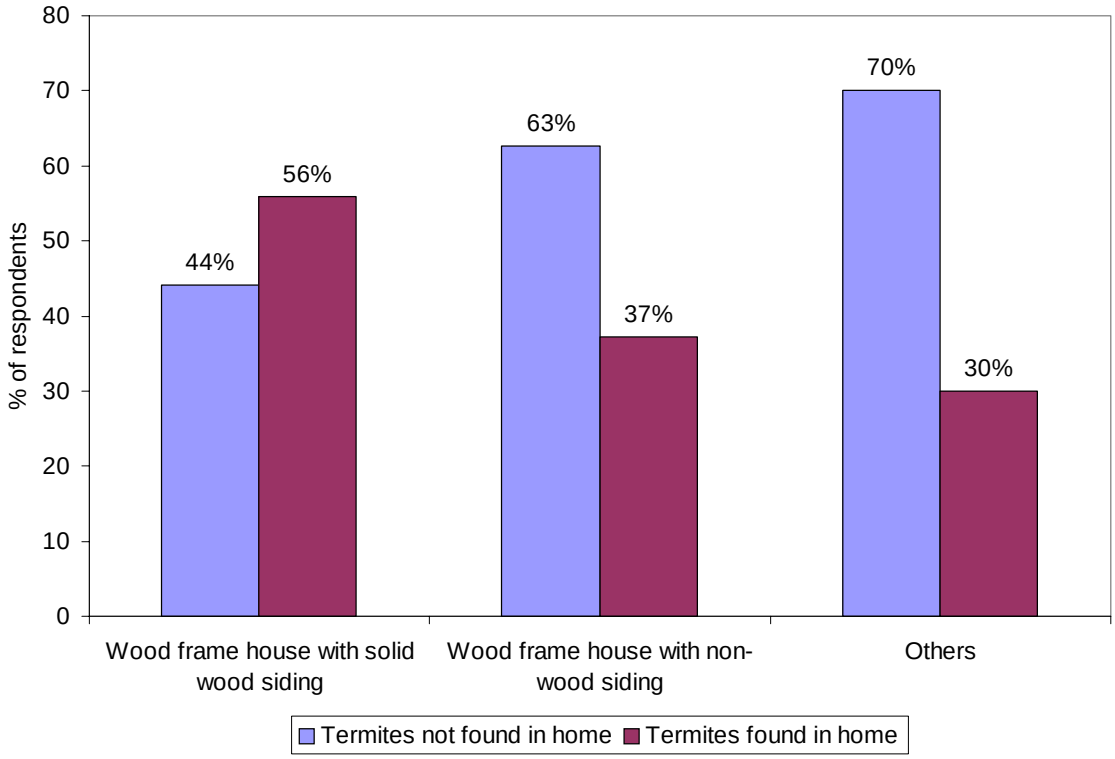


Figure 4.24. Termite Infestation Incidences Cross-Tabulated by Home Construction Type (n=1,209)

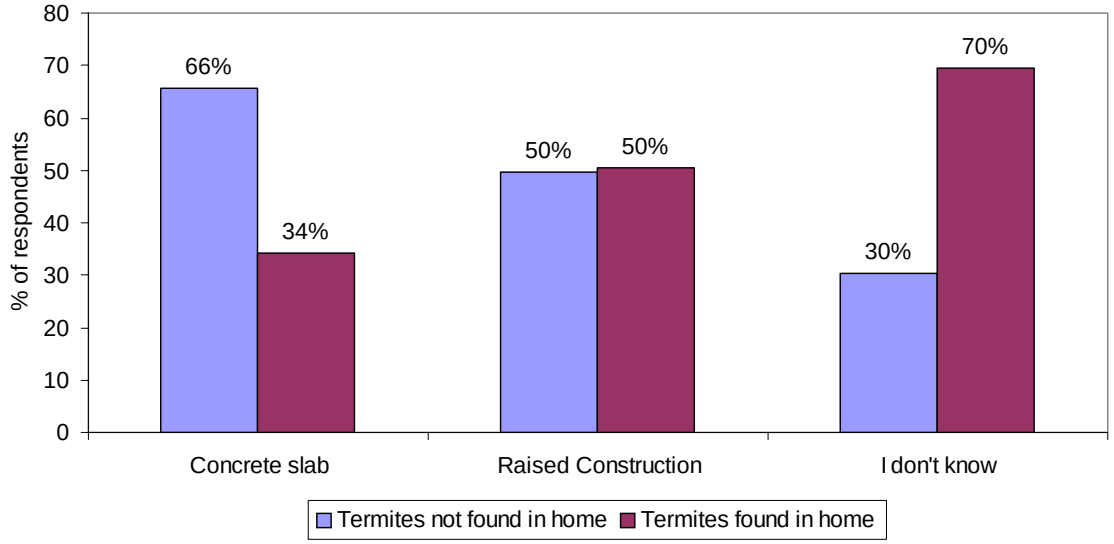


Figure 4.25. Termite Infestation Incidences Cross-Tabulated by Homes Foundation Type (n=1,213)

of home ownership, plans for selling home, education, and income. Chi-square probabilities for these variables are presented in Table 4.2.

Table 4.2. A Summary of Chi-square Tests for Association of Respondent Attitudes About Whether or Not Termites are a Problem in Their Neighborhoods by Other Variables

Variables	Observation	DF	Chi-square	Probability
Termite problem by:				
Location	1,202	6	148.2	0.0001
How long have you owned your current home?	1,204	10	8.7	0.5594
Please estimate the living space of your home in square feet.	1,177	6	14.2	0.0278
Please estimate the approximate current market value of your home	1,179	12	40.6	0.0001
How would you best describe your home's construction?	1,184	14	30.6	0.0063
How would you describe your home's foundation?	1,186	4	22.5	0.0002
Do you plan to sell your home at any point in the future?	1,179	2	6.4	0.0409
To the best of your knowledge, have termites of any kind ever been found in your home?	1,203	2	119.8	0.0001
If termites have been found in your home, please signify which type of termite infestation occurred?	436	14	37.1	0.0007
Have you ever heard of the Formosan Subterranean Termite?	1,193	2	43.2	0.0001
What is your level of education?	1,130	8	23.0	0.0034
What is your estimated total annual pretax household income?	1,000	6	19.9	0.0029

Homeowner attitudes about termites as a problem in their neighborhoods were significantly associated with location (Figure 4.26). The highest proportion of New Orleans respondents (76%) considered termites to be an existing problem in their neighborhoods, followed by Baton Rouge (41%), Alexandria (38%), and Monroe (31%). Similarly, only 8% of New Orleans respondents did not consider termites to be a problem in their neighborhoods, whereas 26%, 32%, and 32% of respondents from Baton Rouge, Alexandria, and Monroe, respectively, did not consider termites to be an existing problem in their neighborhoods.

Length of homeownership did not affect attitudes about whether or not termites were an existing problem in respondents' neighborhoods. In general, homeowners who lived in larger homes were more likely to consider termites more of a problem in their neighborhoods.

Forty-five percent of respondents with wood frame homes with non-wood siding considered termites to be an existing problem in their neighborhoods, whereas 58% of respondents whose homes were wood frame with wood siding considered termites to be an existing problem in their neighborhoods.

Attitudes about termite problems were significantly associated with whether or not termites had been found in respondents' homes. Sixty-five percent of respondents who have found termites in their homes considered termites to be an existing problem, whereas only 34% of respondents who had not found termites in their homes considered termites to be an existing problem.

Education was positively associated with attitudes about termite problems (Figure 4.27). With an increase in education level, the proportion of respondents considering termites to be an existing problem in their neighborhoods increases.

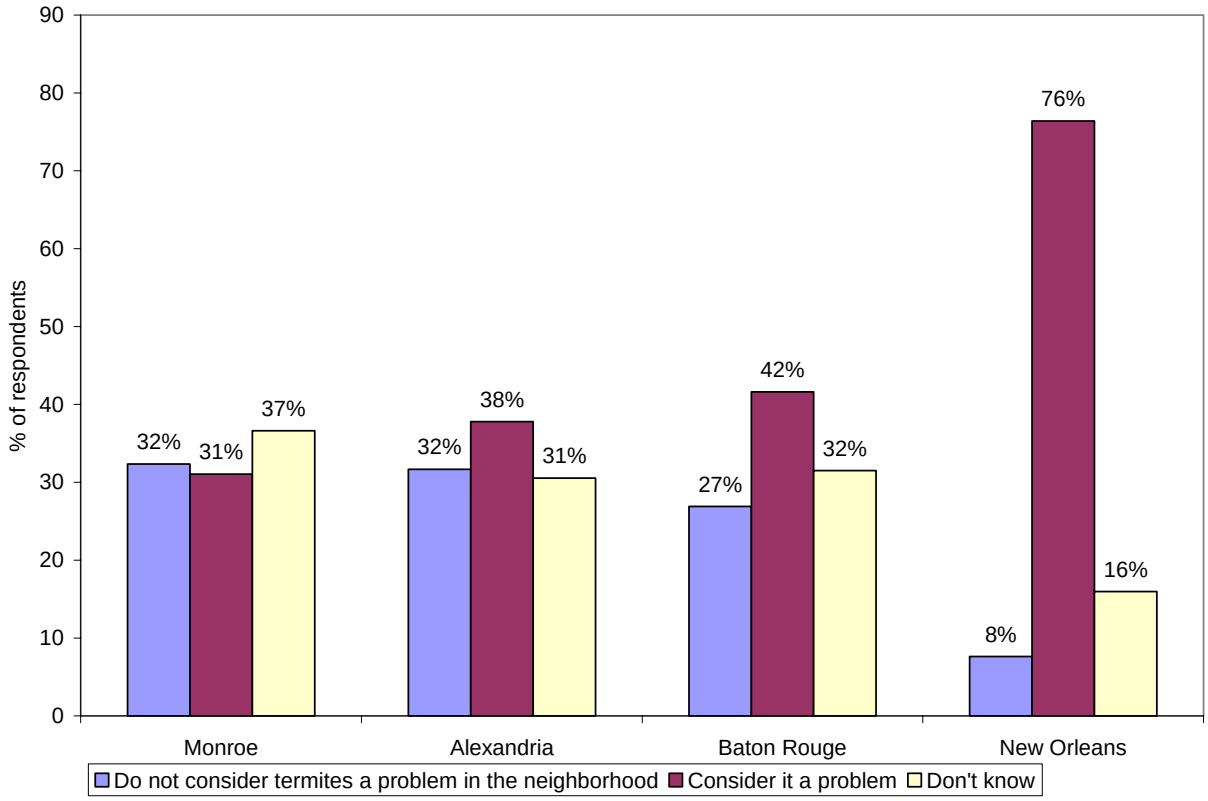


Figure 4.26. Homeowner Attitudes about Whether or Not Termites Were an Existing Problem in Their Neighborhoods Cross-Tabulated by Location (n= 1,202)

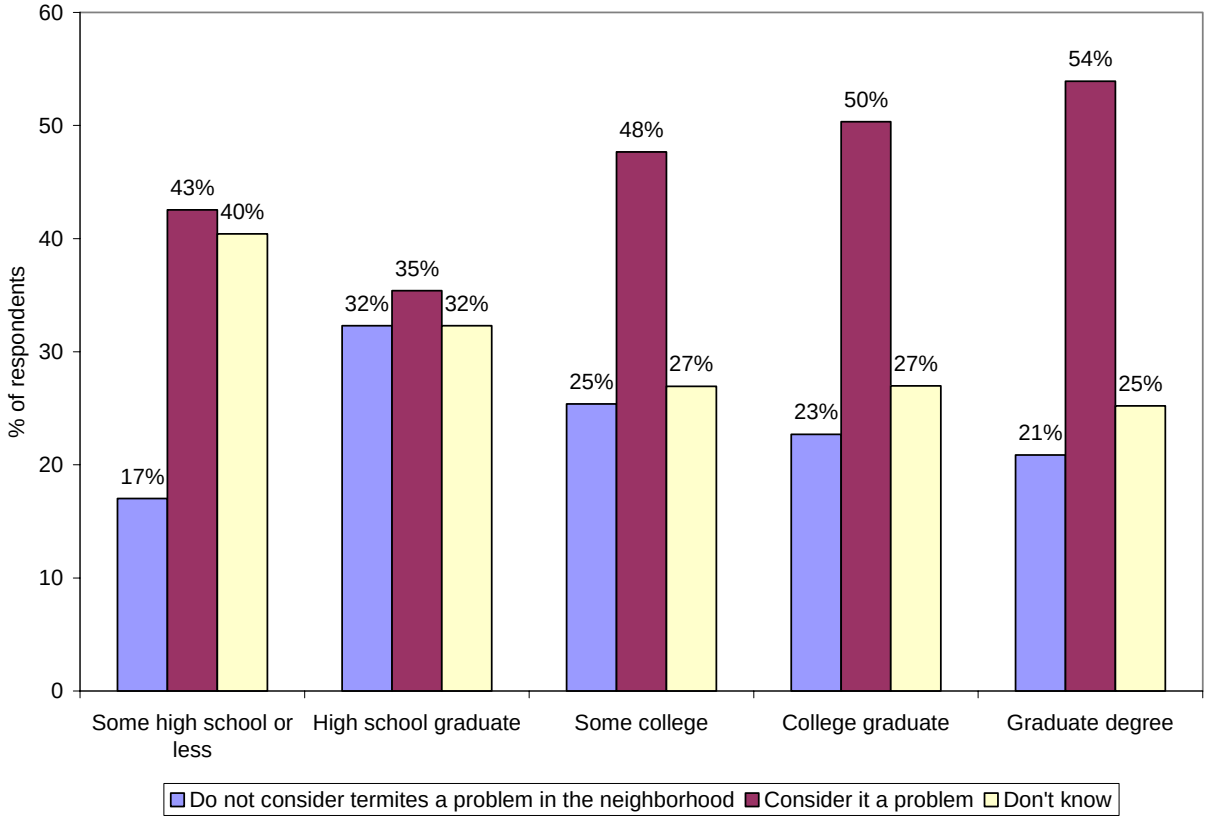


Figure 4.27. Attitude About Whether or not Termites Are an Existing Problem in Homeowners' Neighborhoods Cross-Tabulated by Education (n=1,130)

Income was also significantly associated with respondents' attitudes regarding whether or not termites were an existing problem in their neighborhoods (Figure 4.28). Higher income respondents generally considered termites to be more of a problem in their neighborhoods than lower-income respondents did.

4.4.3 Types of Termite Infestation

Although more than 45% of respondents did not know the type of termite infesting their homes, cases of FST infestations were negligible in Monroe (n= 2), Alexandria (n= 4), and Baton Rouge (n= 1) as compared to New Orleans (51).

4.4.4 Termite Prevention/Control Contracts

Whether or not respondents had a termite prevention contract was cross-tabulated with location, length of home ownership, living space, home construction type, home foundation type, plans for selling home, termite infestation occurrences, knowledge of the FST, income, ethnic background, and gender. Chi-square statistics of these cross-tabulations are presented in Table 4.3. All of the variables except length of ownership, home foundation and gender were significantly correlated to purchase of termite control contract.

As Chi-square results suggest, purchase of a termite control contract by homeowners was significantly associated with location. Fifty-nine percent of the respondents in New Orleans had a termite control contract, compared to 53% of respondents in Baton Rouge, 39% of respondents in Monroe, and 34% of respondents in Alexandria.

Length of homeownership was not significant in the purchase of a termite control contract, as evidenced by the Chi-square probability of 0.62 (Table 4.3). Owners of larger homes were more likely to purchase a termite control contract than respondents with smaller homes.

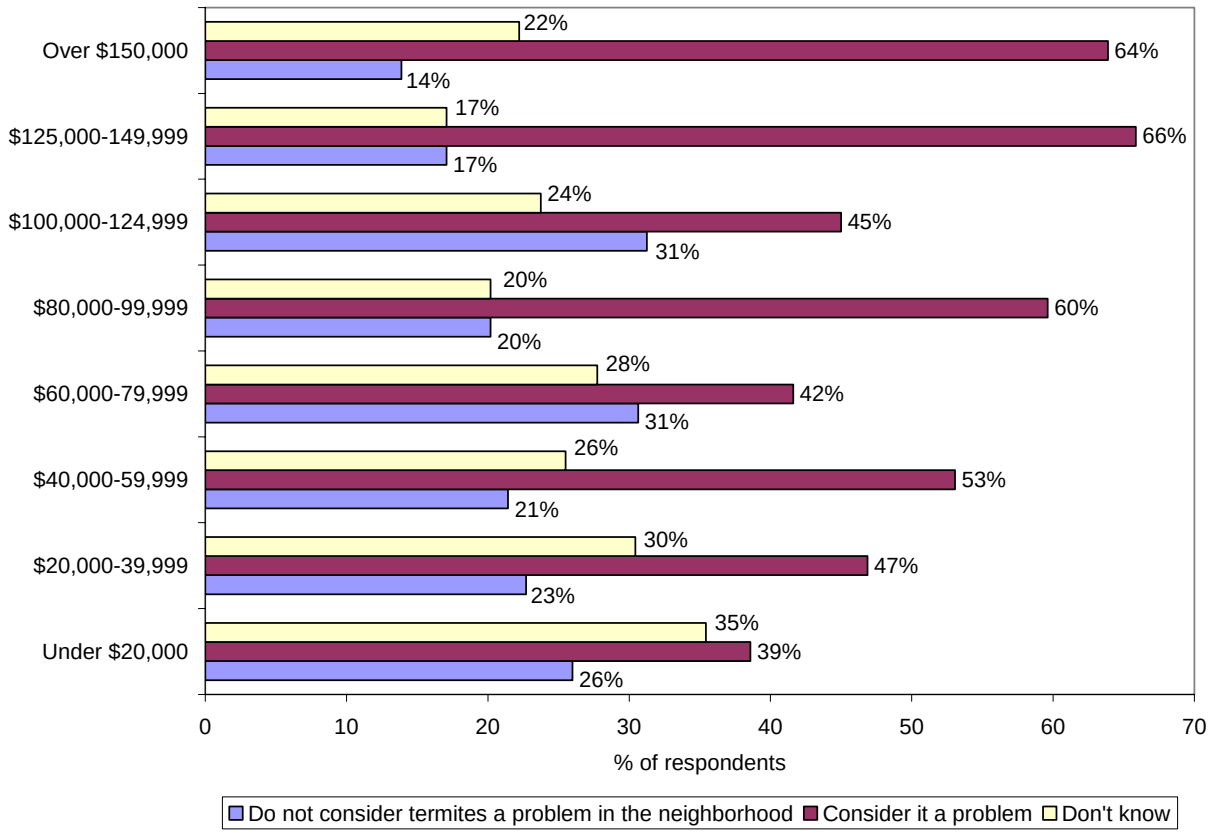


Figure 4.28. Attitudes About Whether or not Termites Were an Existing Problem in Homeowners' Neighborhoods Cross-Tabulated by Income (n=1,000)

Table 4.3. Summary of Chi-square Tests for the Association of Homeowners' Purchase of a Termite Prevention Contract with Other Variables

Variables	Observations	DF	Chi-square	Probability
Termite contract by:				
Location	1,213	3	46.8	0.0001
How long have you owned your current home?	1,214	5	3.5	0.6219
Please estimate the living space of your home in square feet.	1,187	3	77.1	0.0001
Please estimate the approximate current market value of your home	1,186	6	145.7	0.0001
How would you best describe your home's construction?	1,192	7	44.4	0.0001
How would you describe your home's foundation?	1,195	2	5.9	0.0517
Do you plan to sell your home at any point in the future?	1,188	1	5.2	0.0221
To the best of your knowledge, have termites of any kind ever been found in your home?	1,210	1	64.8	0.0001
Have you ever heard of the Formosan Subterranean Termite?	1,213	1	63.1	0.0001
What is your level of education?	1,144	4	60.4	0.0001
What is your estimated total annual pretax household income?	1,007	7	79.0	0.0001
What is your ethnic group?	1,130	5	24.0	0.0002
What is your gender?	1,143	1	3.6	0.0577

Homeowners with high home market values were more likely to purchase termite control contracts than those with homes of lower market value.

Although homeowner purchase of a termite control contract was found to be significantly associated with home construction type, there were less than five observations in some cells. Therefore, the Chi-square probability is questionable. The proportion of respondents with wood frame houses with solid wood siding (48%) and wood frame houses with non-wood siding (49%) seemed to be similar for respondents who had protection contracts, resulting in a significant Chi-square result.

There was significant association between contract purchase by respondents and home foundation type. The proportion of respondents who purchased a contract was higher for those with a concrete slab foundation (49%) than for those with a raised construction (41%).

Homeowners who planned to sell their homes were more likely to purchase a termite control contract. Likewise, respondents who found termites in their homes and those who had heard of the FST were more likely to purchase termite control contracts.

In general, respondents who were more educated were more likely to purchase a termite control contract than respondents who were less educated.

The purchase of a termite control contract was significantly associated with the pre-tax annual income of respondents. The proportion of respondents who purchased termite control contracts increased with higher income. Only 26% of respondents whose annual pre-tax incomes were less than $20,000 had termite control contracts. As annual pretax income increases, the proportion of respondents purchasing termite control contracts increased to 77%.

Purchase of a termite control contract was significantly associated with the respondent's ethnic background. Approximately 50% of Caucasians purchased a termite control contract whereas only 34% of non-Caucasians did so.

Approximately 49% of male respondents purchased a termite control contract, compared to 43% of female respondents.

4.4.5 Homeowner Knowledge of the FST

When we asked respondents about their knowledge of the FST, 1,222 responded. Nearly 25% had never heard of the FST. Cross-tabulations were conducted on "whether or not respondents had heard of the FST" with location, market value of home, home's construction, termite infestation occurrences, whether or not respondents considered termites to be an existing problem in their neighborhoods, whether or not respondents had purchased a termite control contract, and respondents' gender, age, education level, income level, and ethnic background. Whether or not respondents had heard of the FST was significantly associated with all variables. A summary of results of Chi-square tests is presented in Table 4.4.

In terms of location, the highest proportion of respondents who had heard of the FST lived in New Orleans (89%), followed by Baton Rouge (83%), Monroe (68%), and Alexandria (54%). Comparatively, New Orleans respondents were more aware of the FST than respondents in Baton Rouge, Monroe, and Alexandria.

Homeowners who had heard of the FST were significantly associated with respondents who had found termites in their homes. Seventy-two percent of respondents who had not found termites in their homes had heard of the FST, whereas 21% of respondents who had not found termites in their homes were unaware of the FST.

Table 4.4. Summary of Chi-square Tests for the Association of Whether or Not Respondents Have Heard of the FST with Other Variables

Variables	Observation	DF	Chi-square	Probability
Respondents have heard of the FST by:				
Location	1,222	3	116.0	0.0001
Please estimate the living space of your home in square feet.	1,196	3	22.4	0.0001
Please estimate the approximate current market value of your home	1,194	6	85.0	0.0001
How would you best describe your home's construction?	1,200	7	43.2	0.0001
How would you describe your home's foundation?	1,203	2	12.9	0.0016
To the best of your knowledge, have termites of any kind ever been found in your home?	1,219	1	7.6	0.0059
Do you consider termites to be an existing problem for homeowners in your neighborhood?	1,193	2	43.2	0.0001
Do you currently have a termite prevention/control contract?	1,213	1	63.1	0.0001
Gender	1,150	1	25.4	0.0001
Age	1,111	3	38.7	0.0001
What is your level of education?	1,152	4	88.7	0.0001
What is your estimated total annual pretax household income?	1,012	7	59.7	0.0001
What is your ethnic background?	1,136	5	33.4	0.0001

Homeowners who considered termites to be an existing problem in their neighborhoods were significantly associated with respondents who had heard of the FST. Eighty-four percent of respondents who had heard of it considered termites to be an existing problem in their neighborhoods, whereas only 66% of respondents who had heard of the FST did not consider termites to be a problem in their neighborhoods.

The overall severity of the termite problem could be sensed from the number of existing respondents' termite control contracts. Forty-seven percent of respondents said they had a termite control contract. Eighty-five percent of respondents who had heard of the FST had a termite control contract, whereas 65% of respondents who had heard of it did not have a termite control contract. Homeowners who had heard of the FST were more likely to purchase a termite control contract than those who had not.

Male respondents were more likely to have heard of the FST than female respondents. Eighty percent of male respondents had heard of the FST whereas only 66% of females had heard of the FST.

Older respondents were more likely to have heard of the FST. Only 33% of respondents younger than 30 had heard of the FST, whereas 81% of respondents older than 70 had.

Similarly, the higher the education level of respondents, the higher the proportion of respondents who have heard of the FST. Forty-nine percent of respondents with some high school or less education had heard of the FST. This proportion increased to 57%, 73%, 82%, and 88% for high school graduates, respondents with some college, college graduates, and respondents with a graduate degree, respectively. This shows that education can play a role in FST awareness.

Whether or not respondents had heard of the FST was significantly associated with income. The higher the level of income, the higher was the awareness of the FST. This is evident from the fact that only 53% of respondents with an income level of less than $20,000 had heard of the FST, whereas more than 80% of respondents with more than $80,000 annual pre-tax household income had heard of the FST.

Homeowner ethnic background was significantly associated with whether or not respondents had heard of the FST. Seventy-eight percent of Caucasians had heard of the FST whereas only 60% of non-Caucasians had.

4.5 Rating and Evaluation

4.5.1 Pest Control Service Selection Criteria

Homeowners were asked Likert scale questions to rate each selection criterion that would be used for contracting with a pest control service. The rating scale was 1=very unimportant, 2=unimportant, 3=neither important nor unimportant, 4=important, 5=very important. The average scale was calculated for each criterion (Figure 4.29).

The order of importance of each criterion was inferred based on this average scale. If a criterion's average scale was more than 3, the criterion was rated positively and vice versa. Criteria such as treatment success, guarantee, and quality of service were the most important for the respondents.

4.5.2 Level of Trust in Agencies

Homeowners were asked Likert scale questions to rate the level of trust in different agencies. The Likert scale was developed from 1 to 5: 1= do not trust at all, 2=distrust somewhat, 3=neither trust nor distrust, 4=trust somewhat, 5=Trust Completely. All of the

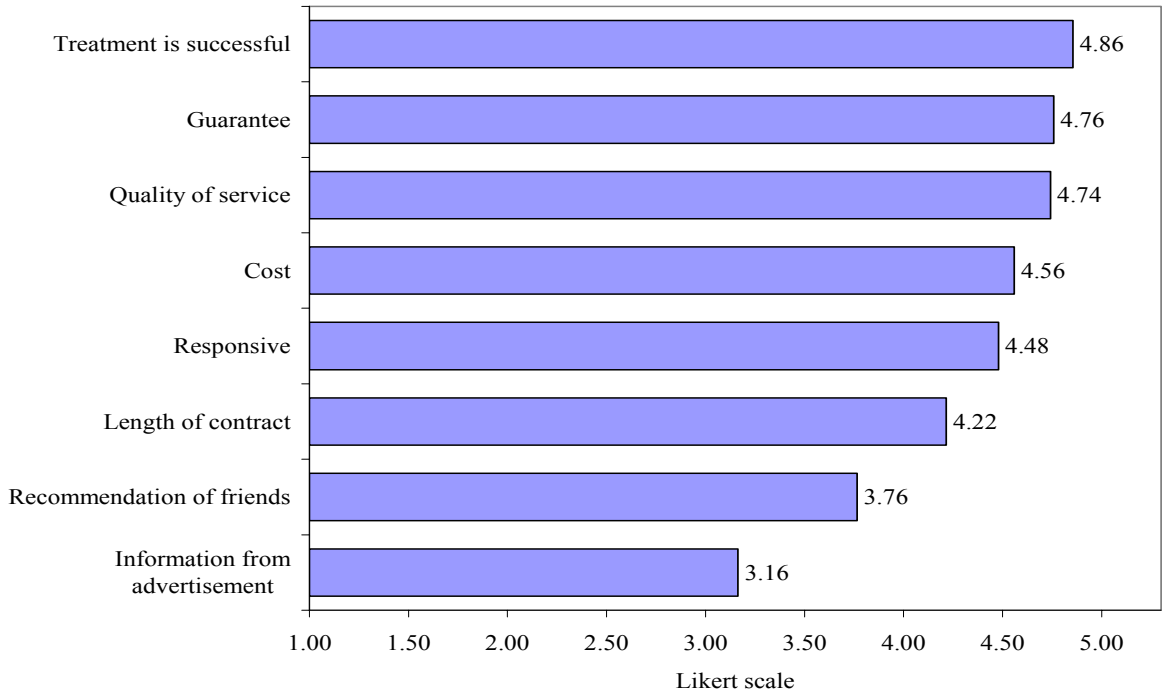


Figure 4.29. Rating of Selection Criteria that Would be Used in Contracting with a Pest Control Service (n=1,087 or more)

agencies were rated positively; however, the LSU AgCenter was found to be the most trusted followed by LDAF, USDA, EPA, LDEQ, PCI and Local government (Figure 4.30).

4.5.3 Homeowners' Attitudes Regarding Chemical Use

Respondents were asked to evaluate the amount of chemicals that are being used to control termites and other pests in Louisiana (Figure 4.31). The majority of respondents chose the 'I don't know' option (58%). There is a knowledge gap among respondents about the use of chemicals in Louisiana. Twenty-seven percent of respondents said that not enough chemicals were being used to fight termites and other insect pests in Louisiana. This indicates that many respondents would accept more chemical use for termite control. Eight percent and 5% of respondents, respectively, chose "Right amount is being used" and "Too much is being used." Two percent of respondents stated that they did not care.

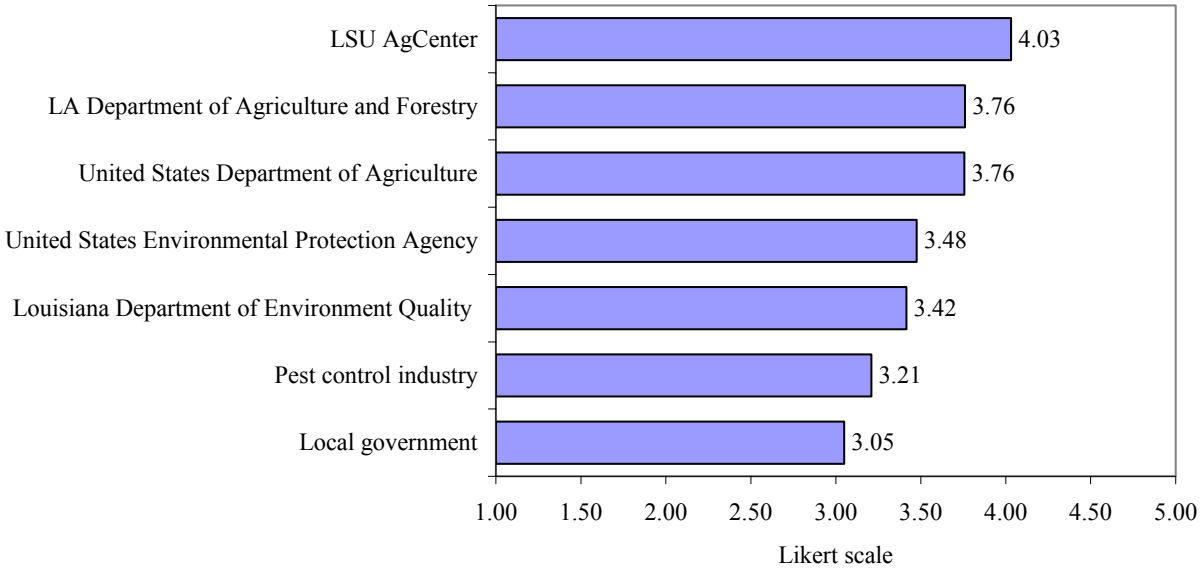


Figure 4.30. Average Likert Scale Value for the Level of Trust in Different Agencies for Their Ability to Provide Information and Guidance about the Safety, Effectiveness, and Application Standards of the Chemicals Used to Control Termites (n=1,121)

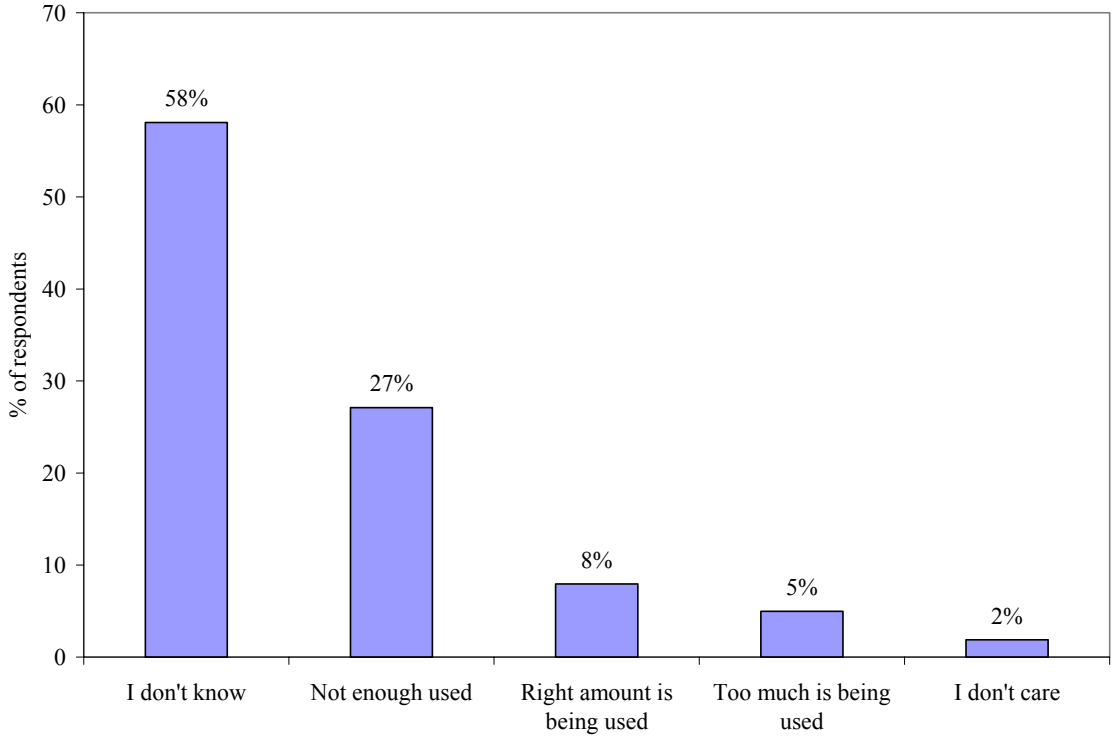


Figure 4.31. Homeowners' Evaluation Regarding the Amount of Chemicals that Are Being Used to Fight Termites and Other Pests in Louisiana (n=1,169)

CHAPTER 5: HYPOTHETCIAL VERSUS REAL WILLINGNESS TO PAY

The contingent valuation method gained credibility after a National Oceanic and Atmospheric Administration (NOAA) panel recommended its use for non-market valuation (Neill *et al.*, 1994). In contingent valuation, respondents are presented hypothetical scenarios and asked hypothetical questions to elicit their willingness to pay or willingness to accept values. Respondents' answers are also based on hypothetical scenarios. A controversy exists among economists regarding valuation in a hypothetical market. Did these hypothetical answers represent respondents' true willingness to pay? Studies have been conducted in the past to test if a respondent's hypothetical willingness-to-pay represents her/his true payment. Most studies show that there is a difference between hypothetical willingness-to-pay and real commitment (List and Shogren, 2002). This difference between hypothetical willingness to pay and the real payment is called hypothetical bias.

The purpose of this section of the study was to discover whether or not hypothetical bias existed regarding willingness to pay for termite control in Louisiana, assuming that termite control is a private good with characteristics of a public good beyond some threshold level. Private goods that have been used in previous hypothetical versus real willingness-to-pay studies have included maps and paintings (Neill *et al.*, 1994*)*, electric juice makers, chocolate boxes and calculators (Cummings *et al.*, 1995), a box of chocolate (Johannesson *et al.*, 1997), antique prints (Paradiso and Trisorio, 2001), and Christmas gifts (List and Shogren, 2002). Some experiments have been conducted with public goods or club goods, such as an informative leaflet regarding the otter - an endangered species (Botelho and Pinto, 2001): and a Citizen's Guide booklet (Taylor, 1998). Termite control has been treated as a private good because homeowners are held responsible for termite control on their own properties. After the start of the invasion of

the FST, especially in the French Quarter of New Orleans, Federal and State funding were used for termite control. Therefore, the undertaking of termite control might gain public good aspects. If termite infestation is beyond an individual homeowner's control level, we expected homeowners would be willing to pay less.

5.1 Survey Methods and Data

Four termite control options presented in the contingent ranking section of the questionnaire may not offer enough choices to homeowners. Therefore, in the contingent ranking section, double bounded questions were asked regarding whether or not homeowners were willing to pay more than $0.56 per square foot per year if that guaranteed 100% termite prevention (Table 5.1).

Table 5.1 Frequency Distribution of Homeowners Who Were Willing to Pay More Than $0.56 per Square Foot per Year for Termite Control

Would you be willing to pay more than $0.56 per square foot per year for termite prevention that 100% guaranteed to prevent termites for as long as you plan to own your home?	**Frequency**	**Percentage**
Yes	290	26.8
No	794	73.2

Only 290 (26.8%) respondents chose yes, but only 150 respondents assigned more than $0.56, for an average of $0.72. Therefore, if more than $0.56 was unreasonable to them, they assigned any amount less than $0.56. A total of 572 homeowners were willing to pay less than $0.56, with an average of $0.21, including 47 persons who protested with zero dollar WTP. Protest here means homeowners' zero bids for reasons other than a true zero value (Jorgensen *et al.*, 1999). Finally, homeowners' above and below $0.56 WTP amounts were combined. A total of 722 homeowners' combined average willingness to pay was $0.32 per square foot per year. Combined figures are hypothetical WTP because these amounts are not the real payments for termite control.

Real payment for termite control was estimated from homeowners' existing contracts with pest control operators. Approximately one-half of homeowners (47%) have a termite control contract. The contract cost consists of an initial installation fee that is applied up front at the start of the service period, and the annual renewal fee. The initial installation fee covers initial inspection and application. The contract period was assumed to be five years. The contract period included the initial fee plus annual inspections for five years. Homeowners were asked to state their initial installation fees in six categories: less than $0-400, $401-800, $800-1,200, $1,201-1,600, $1,601-2,000, and more than $2,000. The mid-point of each category was $200, $600, $1,000, $1,400, $1,800 and $2,200 (Table 5.2). Those homeowners who responded, "do not know" were put in the $0-$400 category, the lowest category. The mid-points of these categories were divided by five to obtain their annual rate.

Table 5.2. Initial Installation Fee for Termite Service Contract

Category	Mid point	Frequency	Percentage
Less than $400	$200	209	37.4
$401-800	$600	121	21.7
$801-1,200	$1,000	42	7.5
$1,201-1,600	$1,400	30	5.4
$1,601-2,000	$1,800	15	2.7
Greater than $2,000	$2,200	9	1.6
I do not know	$200	133	23.8

When homeowners were asked about their existing annual renewal fees, in addition to five categories ($99 or less, $100-199, $200-299, $300-399 and $400 or more) there was an "I do not know" category (Table 5.3).

Homeowners indicating, "I do not know" were put in the first category. The mid-point of each category was calculated as $49.50, $149.50, $249.50, $349.50, and $449.50 respectively. The initial installation fee and the annual renewal fee were added together to obtain the total annual cost of the contract. Total annual cost was divided by the mid-point of the respective

Table 5.3. Annual Renewal Fee for Termite Service Contract

Category	Mid point	Frequency	Percentage
$0-$99	$49.50	232	41.5
$100-$199	$149	205	36.7
$200-$299	$249	46	8.2
$300-$399	$349	23	4.1
$400 or greater	$449	13	2.3
I do not know	$49.50	40	7.2

living space categories of homeowners. Home living space was divided into four categories: less than 1,499 square feet, 1,500-1,999, 2,000-2,999, and 3000 or more square feet (Table 5.4). Thus, mid-points of each category were 750, 1,750, 2,500 and 3,000 square feet.

Table 5.4. Home Living Space Categories

Category	Midpoint	Frequency	Percentage
0-1,499 square feet	750 square feet	226	18.7
1,500-1,999 square feet	1,750 square feet	418	34.6
2,000-2,999 square feet	2,500 square feet	391	32.3
3,000 square feet or more	3,000 square feet	175	14.5

5.2 Models and Data Analysis Methods

The SAS SURVEYREG procedure was used for regression analysis because of its superior handling of complex survey sample designs such as stratification, clustering, and unequal weighing (An and Watts, 2002). Further, it has a built-in correction factor for finite population samples. It treats each of the categories of explanatory variables as dummy variables and estimates the marginal effect of each variable. Expected signs of explanatory variables for the WTP for termite control are presented below. Similar signs are expected for both the hypothetical and the real WTP model.

LOCATION is a categorical variable for survey locations representing higher to lower termite-infested areas with New Orleans the most infested area followed by Baton Rouge, Monroe, and Alexandria. By the same token, the highest WTP amount is expected from

homeowners in New Orleans followed by Baton Rouge, Monroe, and Alexandria. The differences in WTP amounts were expected to be due to homeowners' knowledge and experience of termites.

OWNLENGTH is a categorical variable for the length of ownership of the current home owned by the homeowner. In general, a negative relationship between WTP and the length of home ownership is expected. However, the relationship may be negative for fewer than five years of ownership because many new homes are treated at the time of construction.

LIVSPACE is a categorical variable for home living space. A positive relationship of WTP with living space is expected. In general, higher-income people own bigger homes. It is evident from Chi-square tests that living space is significantly associated with income.

MKTVAL is a categorical variable for homeowners' estimates of the market value of their home. A positive relationship is expected between homeowners' WTP for termite control and market value of homes.

HOMCONST is a categorical variable for type of home construction. A positive relationship between WTP and wood frame homes with solid wood siding is expected because solid wood structures may be more prone to termite infestation. However, HOMCONST may correlate with income. Typically, wood frame/wood siding homes are older and cheaper homes owned by the poor.

HOMSELL is a dummy variable for homeowners' plans for selling their homes. A negative relationship is expected between WTP and plans for home sale because a person may not be willing to invest in a property that she/he is planning to leave soon.

TERMFND is a dummy variable for whether or not termites have been found in the home. A positive relationship is expected between termite infestation occurrences and WTP for termite control.

TERMNEIGH is a categorical variable for the homeowner's perception of termites as an existing problem for her/him in her/his neighborhood. Certainly, a higher WTP is expected from those homeowners who consider termites to be an existing problem in their neighborhoods. They probably perceive the risk of damage as higher; therefore they are more likely to buy "insurance" in the form of a termite prevention/control contract. However, termite control efforts might have public good properties because treating "my home" will not solve the termite problem if "others" are not treating.

FSTHEARD is a dummy variable for whether or not a homeowner has heard of the FST (1=yes). A higher WTP is expected from those who have heard of the FST.

EDUCATION is a categorical variable for the respondent's level of education. The assumption is that more educated people tend to earn more. Therefore, more educated people may be willing to pay higher for termite control. In this case, these two variables are significantly associated.

INCOME is a categorical variable for homeowners' annual pretax total household income. A positive relationship is expected between WTP and income.

ETHNIC is a dummy variable for a homeowner's ethnic background. No prior assumption is made about the relationship between ethnic background and WTP except to hypothesize that there may be a difference in WTP based on ethnicity.

Three different models of ordinary least squares were utilized to estimate the marginal effects of willingness to pay.

5.2.1 OLS Models

WTP_H =f(LOCATION, OWNLENGTH, LIVSPACECATE, , MKTVALCATE, HOMCONST, HOMFOUND, HOMSELL, TERMFND, TERMNEIGH, FSTHEARD GENDER, AGE, EDUCATION, INCOME, ETHNIC)

WTP_R =f(LOCATION, OWNLENGTH, LIVSPACECATE, , MKTVALCATE, HOMCONST, HOMFOUND, HOMSELL, TERMFND, TERMNEIGH, FSTHEARD GENDER, AGE, EDUCATION, INCOME, ETHNIC)

WTP_D =f(LOCATION, OWNLENGTH, LIVSPACECATE, , MKTVALCATE, HOMCONST, HOMFOUND, HOMSELL, TERMFND, TERMNEIGH, FSTHEARD GENDER, AGE, EDUCATION, INCOME, ETHNIC)

Where WTP_R is the real willingness to pay, WTP_H is the hypothetical willingness to pay, and WTP_D is the difference between real and hypothetical willingness to pay.

5.2.2 Logistic Model

This was utilized to model the discrete choice of Yes/No for willingness to pay more than $0.56 per square foot per year for termite control.

WTPYN= f(LOCATION, OWNLENGTH, LIVSPACECATE, , MKTVALCATE, HOMCONST, HOMFOUND, HOMSELL, TERMFND, TERMNEIGH, FSTHEARD GENDER, AGE, EDUCATION, INCOME, ETHNIC)

5.3 Results and Discussion

5.3.1 Descriptive Results

Table 5.5 summarizes the homeowner's hypothetical and real WTP for termite control. Approximately 47% (n=417) of homeowners were paying an average of $0.152 per square foot per year whereas approximately 58% (n=722) of homeowners were willing to pay $0.32 per square foot per year.

Table 5.5. Homeowners' Hypothetical and Real Willingness to Pay for Termite Control and the Difference Between These Two ($0.XX per Sq. Ft. per Year)

Variable	N	Mean	SD	t-value
More than $0.56 WTP	150	0.72	0.17	34.47
Less than $0.56 WTP	572	0.22	0.15	26.01
Combined WTP*	722	0.32	0.26	33.39
Real WTP	417	0.15	0.14	26.27
Difference	280	0.21	0.28	13.36

*this is considered to be the hypothetical WTP.

Real and hypothetical willingness to pay by location is presented in Table 5.6. New Orleans homeowners were willing to pay more for termite control in both a hypothetical and a real sense. Baton Rouge homeowners' average real WTP was $0.15 followed by Alexandria $0.14 and Monroe $0.13.

Table 5.6. Hypothetical Versus Real Willingness to Pay for Termite Control by Location ($0.XX per Sq. Ft. per Year)

Location	Variable	N	Mean	Std Dev	Minimum	Maximum
Monroe	Real WTP	118	0.13	0.11	0.03	0.84
	Hypothetical WTP	160	0.31	0.26	0.00	1.00
Alexandria	Real WTP	83	0.14	0.14	0.03	0.84
	Hypothetical WTP	152	0.30	0.25	0.00	1.00
Baton Rouge	Real WTP	175	0.15	0.15	0.03	0.84
	Hypothetical WTP	228	0.29	0.25	0.00	1.00
New Orleans	Real WTP	166	0.17	0.14	0.03	0.84
	Hypothetical WTP	181	0.38	0.26	0.00	1.00

The second highest hypothetical WTP, however, was from Monroe homeowners ($0.31), followed by Alexandria ($0.30) and Baton Rouge ($0.29). Total real and hypothetical willingness to pay was estimated for Monroe, Alexandria, Baton Rouge, and New Orleans metropolitan areas utilizing average WTP per square foot per year.

Table 5.7 presents the estimated total hypothetical and total real WTP for the four metropolitan areas. The estimated total hypothetical WTP for termite control in the four metropolitan areas was $102,530,742 whereas the total real WTP was estimated to be

$39,465,497. The estimated hypothetical WTP was approximately 2.6 times higher than the estimated real WTP, which was quite consistent with previous research results (List and Shogren, 2002).

Table 5.7. Total WTP Estimates

WTP	Mean WTP	No. of homes times mean living space	Total WTP
Hypothetical	$0.32	(278,111)(0.58*)(1986.36)	$102,530,742
Real	$0.15	(278,111)(0.47**)(1986.36)	$39,465,497
Difference			$63,065,245

* 58% of homeowners were willing to pay for termite control.
** 47% of homeowners have termite prevention contract.

The variable definitions, their means and standard deviations are presented in Table 5.8.

5.3.2 OLS Regression Result

The regression model for hypothetical and real WTP and the model for the difference between hypothetical and real WTP were significant at the 0.5% level. However, only 9.4%, 50.2%, and 27.3% of the variation in hypothetical WTP, real WTP, and the difference between the two was explained by the model, which was evident from the R-square value of respective models. All the variables except AGE and AGESQ were dummy variables. The highest category is the base for categorical variables that is built into the SURVEYREG procedure. Model specific results and interpretations are presented below.

5.3.2.1 Real WTP Model

The results of this model are presented in Table 5.9. In this model, 12 variables were found to be significant, namely OWNLENGTH2, LIVSPACE1, LIVESPACE2, LIVESPACE3, MKTVAL1, MKTVAL2, MKTVAL3, MKTVAL4, TERMNEIGH, FSTHEARD, TERMCONT and EDUCATION4. Holding other variables constant, homeowners owning homes for 6 to 10 years were willing to pay $0.034 more than homeowners who had owned homes for 20 years or more. This was significant at the 6% level. The ownership length category of more than 20 years

Table 5.8. Description of Variables

Variable	Description	Mean	Std. Deviation
Dependent variable			
WTP_H	Hypothetical WTP	$0.32	0.26
WTP_R	Real WTP	$0.15	0.14
WTP_D	Difference between WTPH and WTPR	$0.21	0.28
Independent variable			
1. Homeownership			
LOCATION1	Survey location Monroe (1=yes)	0.25	0.43
LOCATION2	Survey location Alexandria (1=yes)	0.22	0.41
LOCATION3	Survey location Baton Rouge (1=yes)	0.28	0.45
OWNLENGTH1	Length of home ownership <5 years (1=yes)	0.22	0.41
OWNLENGTH2	Length of home ownership 6-10 years (1=yes)	0.19	0.39
OWNLENGTH3	Length of home ownership 11-15 years (1=yes)	0.13	0.33
OWNLENGTH4	Length of home ownership 16-20 years (1=yes)	0.1	0.31
LIVSPACE1	Home living space <1,500 square feet (1=yes)	0.18	0.39
LIVSPACE2	Home living space 1,500-1,999 square feet (1=yes)	0.33	0.47
LIVSPACE3	Home living space 2,000-2,999 square feet (1=yes)	0.31	0.46
MKTVAL1	Home's market value <$50K (1=yes)	0.08	0.27
MKTVAL2	Home's market value $50-$99K (1=yes)	0.33	0.47
MKTVAL3	Home's market value $100-$199K (1=yes)	0.36	0.48
MKTVAL4	Home's market value $200-$299K (1=yes)	0.1	0.29
HOMCONST1	Wood frame house with wood siding (1=yes)	0.15	0.36
HOMCONST2	Wood frame house with non-wood siding (1=yes)	0.73	0.44
HOMCONST3	Other (1=yes)	0.09	0.29
HOMSELL	Plan to sell home in future (1=yes)	0.32	0.47
2. Knowledge of termites			
TERMFND	Termites found in home (1=yes)	0.39	0.48
TERMNEIGH	Termite existing problem in neighborhood (1=yes)	0.46	0.5
FSTHEARD	Heard of FST (1=yes)	0.75	0.43
TERMCONT	Have a termite control contract (1=yes)	0.47	0.5
3. Socio-demography			
GENDER	Female (1=yes)	0.41	0.49
AGE	Age of respondent in years	55.2	14.4
AGESQ	Age squared	3,258	1,641
EDUCATION1	Education: some high school or less (1=yes)	0.04	0.19
EDUCATION2	Education: high school graduate (1=yes)	0.19	0.39
EDUCATION3	Education: some college (1=yes)	0.27	0.44
EDUCATION4	Education: college graduate (1=yes)	0.24	0.43
INCOME1	Income <$40K (1=yes)	0.28	0.45
INCOME2	Income $40K-$79K (1=yes)	0.3	0.46
INCOME3	Income $80K-$124K (1=yes)	0.15	0.36
ETHNIC	Caucasian (1=yes)	0.79	0.4

was the base.

Although other ownership lengths such as less than 5 years, 11 to 15 years, and 16 to 20 years were insignificant, homeowners with these categories may be willing to pay $0.01, 0.016, and $0.004 more respectively, as compared to the base. An explanation could be that most homes with fewer than five years of ownership were new. The foundations of these new homes are usually treated with chemicals during construction. Therefore, this category of homeowners was willing to pay less than those in the 11 to 15 years category. For the categories of more than 11-15 years, homeowners might have more experience in dealing with termites and are thus were willing to pay less. Another reason may be that as one owns a home for a longer period of time and does not suffer termite damage, he becomes less risk averse based on the perception that termites will not invade the home because they have not thus far.

Living space categories (LIVSPACE1, LIVSPACE2, LIVSPACE3) were significantly different from the base living space category of 3,000 square feet or more. In general, results showed that homeowners with smaller houses were willing to pay more on a per unit area basis. Homeowners with less than 1,500 square feet of living space were willing to pay $0.33 higher when compared to the largest living space category as the base, which was significant at the 1% level. Homeowners with 1,500 to 1,999 square feet and 2,000 to 2,999 square feet living spaces, however, were willing to pay only $0.07 and $0.031 more when compared to the base category. This might have been partly due to the contract basis, which might not have been fully based on per unit area.

Home market value was found to be significant in all categories compared to the base category of $300,000 or more. Signs were found to be as expected. In general, homeowners with higher valued homes were willing to pay more. Homeowners with a home market value of less

Table 5.9. Parameter Estimates of the Real WTP Model

Parameter	Estimate	Error	t-value	Probability
INTERCEPT	0.219***	0.10013119	2.18	0.0295
LOCATION1	-0.010	0.01491005	-0.68	0.5000
LOCATION2	-0.010	0.01764656	-0.56	0.5768
LOCATION3	-0.008	0.01427488	-0.57	0.5716
OWNLENGTH1	0.010	0.01443070	0.72	0.4709
OWNLENGTH2	0.034**	0.01827668	1.87	0.0615
OWNLENGTH3	0.016	0.01911345	0.83	0.4047
OWNLENGTH4	0.004	0.01636251	0.24	0.8095
LIVSPACE1	0.333***	0.03910646	8.53	0.0001
LIVSPACE2	0.070***	0.01440555	4.85	0.0001
LIVSPACE3	0.031***	0.01046497	2.94	0.0035
MKTVAL1	-0.211***	0.04761554	-4.43	0.0001
MKTVAL2	-0.043***	0.02170001	-1.98	0.0488
MKTVAL3	-0.042***	0.01481200	-2.81	0.0052
MKTVAL4	-0.032***	0.01362980	-2.35	0.0191
HOMCONST1	0.014	0.02481527	0.57	0.5706
HOMCONST2	0.015	0.02139783	0.72	0.4719
HOMSELL	-0.007	0.01183203	-0.55	0.5801
TERMFND	-0.013	0.01028383	-1.27	0.2059
NEIGHDUM	0.023***	0.01027179	2.20	0.0282
FSTHEARD	0.023*	0.01611756	1.45	0.1472
TERMCONT	-0.062***	0.02659330	-2.34	0.0195
GENDER	0.011	0.01074401	0.98	0.3277
AGE	-0.003	0.00289604	-1.00	0.3177
AGESQ	0.000	0.00002416	1.17	0.2426
EDUCATION1	0.009	0.03486998	0.26	0.7929
EDUCATION2	-0.009	0.02276681	-0.40	0.6891
EDUCATION3	-0.019	0.01468428	-1.28	0.2016
EDUCATION4	-0.031***	0.01215950	-2.55	0.0111
INCOME1	-0.002	0.01805104	-0.11	0.9141
INCOME2	0.008	0.01271167	0.67	0.5049
INCOME3	0.015	0.01184230	1.23	0.2176
ETHNIC	-0.010	0.01776062	-0.57	0.5670

*, **, *** indicate coefficients significant at the 0.15, 0.10, and 0.05 level, respectively.

than $50,000 were willing to pay $0.21 less per square foot per year when compared to the base, which was significant at the 1% level. Similarly, homeowners with a home market value of $50,000-99,999, $100,000-199,999 and $200,000-299,999 were willing to ay $0.043, $0.041, and $0.032 less than the base category, respectively. All of these categories were significant at the 5% level.

The variable TERMNEIGH was significant at the 5% level. Homeowners who consider termites to be an existing problem in their neighborhoods were willing to pay $0.023 more than homeowners that do not consider termites to be a problem in their neighborhoods. Similarly, homeowners who have heard of the FST were willing to pay $0.023 more than those who have not heard of it. The level of significance, however, was only 15%. The variable TERMCONT was significant at the 5% level. Homeowners who have termite control contracts were willing to pay $0.062 less than those who do not have such contracts. Perhaps homeowners who do not have contracts want to have an option that guarantees 100% termite prevention. Otherwise, they will not purchase the contract.

Although only EDUCATION4 was significant, signs of other education variables were as expected, except EDUCATION1. Homeowners with college degrees were willing to pay significantly less, $0.031 per square foot per year, than homeowners with a graduate or professional degree . The sign of other homeowner education level categories, namely EDUCATION2 and EDUCATION3, were as expected; however, these were not significant.

Higher income homeowners were expected to be willing to pay more than lower income homeowners. The signs of variables INCOME2 and INCOME3 were unexpected, where homeowners $40,000-79,999 and $80,000-124,999 income categories were willing to pay more than homeowners whose household income was $125,000 or more. Although LOCATION was

not significant, New Orleans homeowners were willing to pay the highest amount, followed by Baton Rouge, Monroe, and Alexandria homeowners, which was as expected.

5.3.2.2 Hypothetical WTP Model

The results of this model are presented in Table 5.10. As the results indicate, hypothetical WTP was significantly influenced by (1) living space (LIVSPACE3), (2) homeowner attitudes about whether or not termites are an existing problem in their neighborhoods (TERMNEIGH), (3) whether or not the homeowner has a termite control contract (TERMCONT), (4) the homeowner's gender (GENDER), (5) pretax annual household income (INCOME), and (6) the homeowner's ethnic background (ETHNIC). These variables were significant respectively at the 13%, 8%, 6%, 6%, 4%, and 0.2% levels. Holding other variables constant, a homeowner with a living space of 2,000-2,999 square feet was willing to pay $0.062 more per square foot for termite control than a homeowner with 3,000 square feet of living space.

Similarly, homeowners who currently have a termite contract were willing to pay $0.043 more than those who do not have such a contract. This may be due to different levels of awareness about termites. Awareness levels may be higher for those who had a termite control contract than for those who did not.

Female homeowners were willing to pay $0.044 more than males. In general, homeowners with higher incomes were willing to pay more for termite control, which was as expected. Homeowners with annual pretax household incomes of $40,000 or less were willing to pay $0.106 less per square foot per year than homeowners with an income of $125,000 or more. This difference was as expected, because the utility for higher income people is low for the same amount of dollars. Similarly, homeowners with an annual pretax household income of $40,000 to

Table 5.10. Parameter Estimates of the Hypothetical WTP Model

Parameter	Estimate	Error	t-value	Probability
INTERCEPT	0.591***	0.17559341	3.36	0.0008
LOCATION1	-0.024	0.03531802	-0.68	0.4973
LOCATION2	0.000	0.03717542	0.00	0.9961
LOCATION3	-0.041	0.03091535	-1.34	0.1809
OWNLENGTH1	-0.002	0.03585718	-0.05	0.9597
OWNLENGTH2	-0.011	0.03351572	-0.31	0.7533
OWNLENGTH3	0.038	0.04101635	0.93	0.3553
OWNLENGTH4	-0.028	0.03770047	-0.74	0.4585
LIVSPACE1	0.039	0.05549883	0.70	0.4868
LIVSPACE2	0.020	0.04441435	0.44	0.6568
LIVSPACE3	0.062*	0.04065430	1.52	0.1298
MKTVAL1	-0.071	0.07934567	-0.89	0.3741
MKTVAL2	-0.015	0.05888744	-0.26	0.7984
MKTVAL3	-0.049	0.05281570	-0.92	0.3562
MKTVAL4	-0.040	0.05117393	-0.78	0.4370
HOMCONST1	-0.036	0.05016544	-0.71	0.4793
HOMCONST2	0.012	0.04584072	0.26	0.7917
HOMSELL	0.026	0.02384257	1.10	0.2697
TERMFND	-0.019	0.02430476	-0.78	0.4334
TERMNEIGH	0.038**	0.02191260	1.75	0.0800
FSTHEARD	0.009	0.03047497	0.31	0.7595
TERMCONT	0.043**	0.02317206	1.86	0.0632
GENDER	0.044**	0.02262175	1.95	0.0521
AGE	-0.007	0.00533355	-1.24	0.2157
AGESQ	0.000	0.00004662	1.44	0.1505
EDUCATION1	0.012	0.07662546	0.16	0.8724
EDUCATION2	-0.051	0.03864491	-1.32	0.1874
EDUCATION3	-0.019	0.03231023	-0.57	0.5663
EDUCATION4	-0.041	0.02920982	-1.39	0.1658
INCOME1	-0.106***	0.05141867	-2.05	0.0404
INCOME2	-0.071	0.04585030	-1.55	0.1222
INCOME3	-0.061	0.04241696	-1.43	0.1526
ETHNIC	-0.097***	0.03126775	-3.11	0.0019

*, **, *** indicate coefficient significance at the 0.15, 0.10, and 0.05 level respectively.

$79,000 were willing to pay $0.071 less per square foot than homeowners with incomes of $125,000 or more.

Caucasians were willing to pay $0.10 less than non-Caucasians. This may be due in part to the termite-prone house structures of non-Caucasians: a higher proportion of non-Caucasians lived in homes with wooden frames and solid wood siding and thus they provide more "food" for termites. In addition, these homes tend to be raised construction, which was also found to be more prone to termite infestation.

Variables related to location (LOCATION1, LOCATION2, LOCATION3) were not found to be significant. However, the highest WTP amount was estimated to be New Orleans followed by Baton Rouge, Monroe, and Alexandria, which was as expected.

5.3.2.3 Difference Model

Results of this model are presented in Table 5.11. This model explains the factors that contribute to the difference between homeowners' hypothetical WTP and real WTP (i.e., hypothetical bias) for termite control in Louisiana. Variables related to length of ownership, living space, income, and ethnic background significantly explain the hypothetical biases, where hypothetical WTP was significantly higher than real WTP. Homeowners' attitudes about whether or not termites are considered to be an existing problem (TERMNEIGH) was also significant in explaining hypothetical bias.

Hypothetical bias was $0.099 less for homeowners with fewer than five years of ownership (OWNLENGTH1) than the base length of ownership category of more than 20 years. Similarly, homeowners with 5 to 10 years, 11 to 15 years and 16 to 20 years of length of ownership were respectively contributing $0.092, $0.046, and $0.065 less to the hypothetical biases of WTP than the base category.

Table 5.11. Parameter Estimates of the Difference WTP Model

Parameter	Estimate	Error	t-value	Probability
INTERCEPT	0.723***	0.33431318	2.16	0.0315
LOCATION1	-0.026	0.05485777	-0.48	0.6340
LOCATION2	0.056	0.06348071	0.88	0.3813
LOCATION3	-0.055	0.04781761	-1.16	0.2476
OWNLENGTH1	-0.099**	0.05687968	-1.75	0.0821
OWNLENGTH2	-0.093**	0.05453266	-1.70	0.0907
OWNLENGTH3	-0.047	0.06033586	-0.78	0.4384
OWNLENGTH4	-0.065	0.06426151	-1.02	0.3109
LIVSPACE1	-0.352***	0.10039100	-3.50	0.0005
LIVSPACE2	-0.055	0.06878071	-0.79	0.4282
LIVSPACE3	0.011	0.05721454	0.20	0.8425
MKTVAL1	0.160	0.16843396	0.95	0.3418
MKTVAL2	-0.055	0.08987695	-0.61	0.5402
MKTVAL3	-0.024	0.07575608	-0.32	0.7512
MKTVAL4	-0.029	0.06988586	-0.42	0.6740
HOMCONST1	-0.062	0.09938483	-0.63	0.5323
HOMCONST2	-0.025	0.09172949	-0.28	0.7829
HOMSELL	0.047	0.03864143	1.23	0.2207
TERMFND	-0.021	0.03509570	-0.61	0.5415
NEIGHDUM	0.052*	0.03196387	1.63	0.1048
FSTHEARD	-0.002	0.05855514	-0.04	0.9675
GENDER	0.000	0.03606935	0.01	0.9900
AGE	-0.008	0.00966750	-0.81	0.4171
AGESQ	0.000	0.00008035	0.92	0.356
EDUCATION1	0.008	0.17672649	0.04	0.9644
EDUCATION2	-0.065	0.06211715	-1.05	0.2959
EDUCATION3	-0.029	0.04586341	-0.63	0.5270
EDUCATION4	0.024	0.04134135	0.58	0.5604
INCOME1	-0.155***	0.07247940	-2.13	0.0337
INCOME2	-0.109**	0.06021224	-1.80	0.0726
INCOME3	-0.117***	0.05544387	-2.10	0.0365
ETHNIC	-0.102**	0.05811022	-1.75	0.0814

*, **, *** indicate coefficient significance at the 0.15, 0.10, and 0.05 level, respectively.

Homeowners with living space smaller than 1,500 square feet (LIVSPACE1) were contributing $0.35 less to hypothetical bias than the base category of 3,000 square feet or more, which was significant at the 1% level. However, other living space categories were not significant. Homeowners who thought termites were an existing problem in their neighborhoods (TERMNEIGH) were contributing $0.052 more to the difference than those who did not consider termites to be an existing problem in their neighborhoods.

INCOME1, INCOME2 and INCOME3 were significant at the 5%, 10%, and 5% levels. Compared to the base income category ($125,000 or more), homeowners with incomes below $40,000, $40,000 to $79,999 and $80,000 to $124,999, respectively, were contributing $0.155, $0.109 and $0.117 less to the hypothetical bias. Caucasians were contributing $0.102 less to the hypothetical bias than non-Caucasians. This clearly shows that hypothetical bias was higher due to non-Caucasians.

5.3.3 Logistic Regression Results

The results of this model are presented in Tables 5.12 and 5.13. Homeowners' yes/no responses for willingness to pay more than $0.56 was modeled using a logistic model, which estimated the probability that homeowners would be willing to pay more than $0.56 per square foot per year. Yes/no responses for willingness to pay as a discrete dependent variable were influenced by independent variables related to home and home ownership, knowledge and attitude about termites, and homeowners' socio-demographics.

The overall model was significant, as indicated by the significance level of the Likelihood Ratio (0.1%), the Score test (0.1%), and the Wald test (0.4%). Variables related to the length of home ownership, the market value of the home, the homeowner's gender, income, and ethnic background were found to be significant.

All the variables except AGE and AGESQ were dummies, hence interpretation of logit coefficients are more intuitive in this case. For example, point estimate of the odds ratio of LOCATION1 versus LOCATION4 was 0.851. This means that the odds that Monroe homeowners would answer yes were approximately 15% lower than New Orleans homeowners. If we reverse the odds, it becomes 1.175. This means that the odds that New Orleans homeowners would answer yes were 17.5% higher than Monroe homeowners. The odds ratio is simply a ratio of probability of "success" and probability of "failure" where "success plus failure" equals one.

We can interpret all of the variables' odds ratios in a similar fashion. Length of ownership affects homeowners' choices of "yes or no." The odds ratio for LIVSPACE1 versus LIVSPACE5 was 1.24. The odds of homeowners owning their homes for fewer than five years were 24% higher than the odds of homeowners owning their homes for more than 20 years. On the other hand, the odds of homeowners owning their homes for 6 to 10 years were 40% lower than the odds that they would own their homes for more than 20 years. The odds that a female would answer yes were 55.2% higher than males.

Table 5.12. Parameter Estimates from Logistic Regression for Yes/No Responses for Homeowners Willing to Pay More Than $0.56 per Square Foot per Year.

Variables	Estimates	Chi-square	Probability
INTERCEPT	0.9170	0.614	0.433
LOCATION1	0.0844	0.309	0.433
LOCATION2	-0.1848	1.213	0.271
LOCATION3	0.1774	1.516	0.218
OWNLENGTH1	-0.3819***	5.117	0.024
OWNLENGTH2	0.3431**	3.640	0.056
OWNLENGTH3	0.0925	0.204	0.652
OWNLENGTH4	0.1129	0.261	0.609
LIVSPACE1	0.0302	0.022	0.884
LIVSPACE2	0.1931	1.520	0.217
LIVSPACE3	-0.1118	0.562	0.454
MKTVAL1	-0.2883	0.726	0.394
MKTVAL2	0.0217	0.012	0.912
MKTVAL3	0.0743	0.191	0.662
MKTVAL4	0.6175***	4.954	0.026
HOMCONST1	0.0078	0.002	0.964
HOMCONST2	0.0575	0.172	0.679
HOMSELL	0.0515	0.077	0.782
TERMFND	0.0096	0.003	0.959
TERMNEIGH	-0.2685*	2.087	0.148
FSTHEARD	-0.3004	1.655	0.198
TERMCONT	-0.1511	0.624	0.429
GENDER	-0.4394***	6.196	0.013
AGE	-0.0045	0.012	0.914
AGESQ	0.0001	0.057	0.812
EDUCATION1	-0.3387	0.760	0.383
EDUCATION2	0.1610	0.608	0.436
EDUCATION3	0.0220	0.017	0.897
EDUCATION4	0.0255	0.020	0.888
INCOME1	0.4333***	4.637	0.031
INCOME2	0.0396	0.079	0.779
INCOME3	-0.1776	1.140	0.286
ETHNIC	0.7165***	10.055	0.002

*, **, *** indicate coefficient significance at the 0.15, 0.10, and 0.05 levels, respectively.

Table 5.13. Odds Ratio Estimates

Variable Effect	Odds Ratio	95% Confidence Limits	
LOCATION 1 vs 4	0.851	0.503	1.438
LOCATION 2 vs 4	1.114	0.632	1.962
LOCATION 3 vs 4	0.775	0.479	1.255
OWNLENGTH 1 vs 5	1.24	0.731	2.104
OWNLENGTH 2 vs 5	0.601	0.348	1.038
OWNLENGTH 3 vs 5	0.772	0.432	1.38
OWNLENGTH 4 vs 5	0.756	0.411	1.39
LIVSPACE 1 vs 4	0.868	0.402	1.871
LIVSPACE 2 vs 4	0.737	0.376	1.447
LIVSPACE 3 vs 4	1	0.552	1.811
MKTVAL 1 vs 5	0.872	0.289	2.629
MKTVAL 2 vs 5	0.64	0.275	1.488
MKTVAL 3 vs 5	0.607	0.292	1.26
MKTVAL 4 vs 5	0.353	0.162	0.768
HOMCONST 1 vs 3	0.93	0.462	1.87
HOMCONST 2 vs 3	0.884	0.485	1.615
HOMSELL	0.95	0.66	1.367
TERMFND	0.99	0.684	1.434
NEIGHDUM	1.308	0.909	1.883
FSTHEARD	1.35	0.855	2.134
TERMCONT	1.163	0.8	1.692
GENDER	1.552	1.098	2.193
AGE	1.005	0.925	1.09
AGESQ	1	0.999	1.001
EDUCATION 1 vs 5	1.598	0.572	4.462
EDUCATION 2 vs 5	0.97	0.532	1.766
EDUCATION 3 vs 5	1.114	0.681	1.823
EDUCATION 4 vs 5	1.11	0.702	1.756
INCOME 1 vs 4	0.483	0.225	1.035
INCOME 2 vs 4	0.715	0.378	1.355
INCOME 3 vs 4	0.889	0.474	1.668
ETHNIC	0.488	0.314	0.761

CHAPTER 6: CONTINGENT RANKING

In contingent ranking, respondents are faced with a set of options that vary in price and attributes. They rank their choices rather than just choose one that they most prefer. Their most preferred option gives the highest utility for the respondent.

As noted in Chapter 2, contingent ranking has been successfully utilized for the valuation of a variety of environmental goods, including the demand for electric cars (Beggs *et al.* 1981), water quality improvement (Desvousges *et al.* 1983), river water quality improvement (Smith and Desvousges 1986), diesel odor reduction (Lareau and Rae, 1989), the recreational benefits of public forest (Hanley and Ruffell, 1993), the environmental health and employment effects of energy programs (Johnson and Desvousges, 1997), air quality valuation (Riera and Penin, 1997), biodiversity conservation (Garrod and Willis, 1997), amenity loss estimate for recreational users (Garrod and Willis, 1998), the conservation benefit of environmentally sensitive areas (Hanley *et al.* 1998), curbside waste disposal (Caplan *et al,* 2002) and atmospheric pollution reduction (Ortuzar and Rodriguez, 2002).

In this study, respondents were given four termite control options that varied in price and contract attributes. The details of these options are presented in Appendix 1 (page 122). The costs of these options from Alternative 1 to Alternative 4 in per square feet per year are $0, $0.13, $0.43, and $0.56, respectively, for an average living space of 2,000 square feet. In the same way, the attributes differed by the application of liquid and bait treatments and the number of home inspection visits by the pest control operator.

6.1 The Model

Multinomial LOGIT or PROBIT models would fail to account for the ordinal nature of dependent variables (Greene, 2000). In this application, termite control options are the ordered

response. Multinomial LOGIT or PROBIT models require estimation of more numbers of parameters in the case of four alternatives, thus reducing the degrees of freedom available for estimation. These models are also associated with an undesirable property of the independence of irrelevant alternatives (Ben-Akiva and Lerman, 1985). While multinomial PROBIT lacks a close-form likelihood (Greene, 2000), ordinary least squares regression also fails to account for ordered independent variables. Using an ordered PROBIT model solves this problem. The functional form for the ordered PROBIT model is represented as follows:

$y_n^* = \beta' x_n + \varepsilon_n$

where y_n^* = latent and continuous measure of termite control effort chosen by respondent *n*

x_n = a vector of explanatory variables describing the respondents' socio-demographic characteristics, home ownership characteristics and knowledge about termites

β' = vector of parameters

ε_n = a random error term assumed to be normally distributed

The observed discrete termite control effort level, y_n, is determined from the model below:

y_n	= 1	if $-\infty \le y^* \le \mu_1$	(no control)
	= 2	if $\mu_1 < y^* \le \mu_2$	(contract with liquid treatment)
	= 3	if $\mu_2 < y^* \le \mu_3$	(contract with bait treatment)
	= 4	if $\mu_3 < y^* \le \infty$	(contract with liquid plus bait treatment)

The μ's are thresholds at different levels to be estimated with β. Respondents' ordering choices depend on certain measurable factors *x* and unobservable factors ε. In principle, they could respond to the questionnaire with their own y* if asked to do so. They would choose the value that most closely represents their own cost estimate. With the normal distribution of error terms, the probability of coded responses varies with orders as given.

Probability of no control option (y =1)

$$\Pr(y_n = 1) = \Pr(y_n^* \le \mu_1)$$
$$= \Pr(\beta' x_n + \varepsilon_n \le \mu_1)$$
$$= \Pr(\varepsilon_n \le \mu_1 - \beta' y_n^*)$$
$$= \Phi(\mu_1 - \beta' y_n^*)$$

Probability of choosing the contract with liquid termite control (y=2)

$$\Pr(y_n = 2) = \Pr(\mu_1 < y_n^* \le \mu_2)$$
$$= \Pr(\varepsilon_n \le \mu_2 - \beta' y_n^*) - \Pr(\varepsilon_n \le \mu_1 - \beta' y_n^*)$$
$$= \Phi(\mu_2 - \beta' y_n^*) - \Phi(\mu_1 - \beta' y_n^*)$$

Probability of choosing the contract with bait treatment (y=3)

$$\Pr(y_n = 3) = \Pr(\mu_2 < y_n^* \le \mu_3)$$
$$= \Pr(\varepsilon_n \le \mu_3 - \beta' y_n^*) - \Pr(\varepsilon_n \le \mu_2 - \beta' y_n^*)$$
$$= \Phi(\mu_3 - \beta' y_n^*) - \Phi(\mu_2 - \beta' y_n^*)$$

Probability of choosing the contract with bait plus liquid treatment (y=4)

$$\Pr(y_n = 4) = \Pr(\mu_3 < y_n^* \le \mu_4)$$
$$= \Pr(\varepsilon_n \le \mu_4 - \beta' y_n^*) - \Pr(\varepsilon_n \le \mu_3 - \beta' y_n^*)$$
$$= 1 - \Phi(\mu_3 - \beta' y_n^*)$$

In order for all of the probabilities to be positive, we must have $0 < \mu_1 < \mu_2 < \mu_3 < \mu_4$.

Probabilities of random error in the ordered PROBIT model are presented in Figure 6.1.

For the three probabilities, the marginal effects of changes in the regressors are;

$$\frac{\partial \Pr b(y = 0)}{\partial x} = -\phi(\beta' x)\beta$$
$$\frac{\partial \Pr ob(y = 1)}{\partial x} = (\phi(-\beta' x) - \phi(\mu - \beta' x)\beta$$
$$\frac{\partial \Pr ob(y = 2)}{\partial x} = \phi(\mu - \beta' x)\beta$$

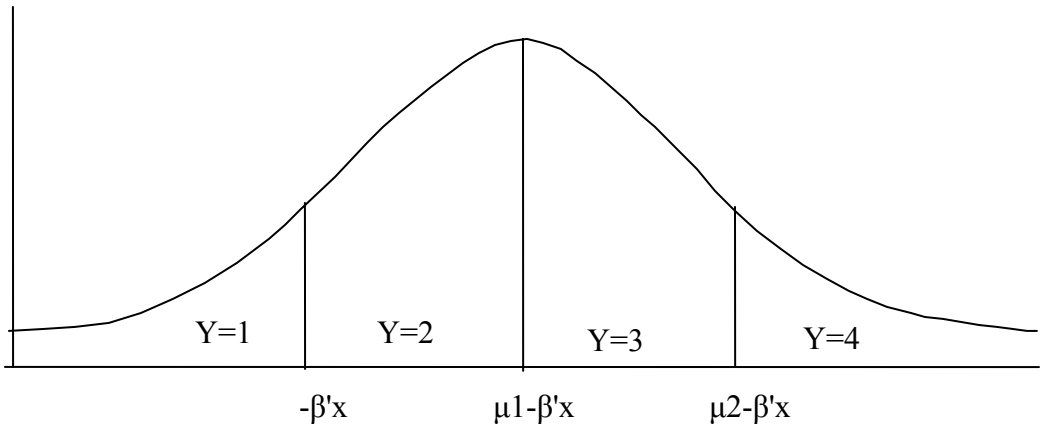


Figure 6.1. Probabilities in the Ordered PROBIT Model

These changes are presented in Figure 6.2. Because μ and β are constant, changes in x shift the curve. An increase is shown, shifting the curve to the right. β is the model's primary parameter. If β is positive, a higher-valued termite control option is associated with that variable and vice versa.

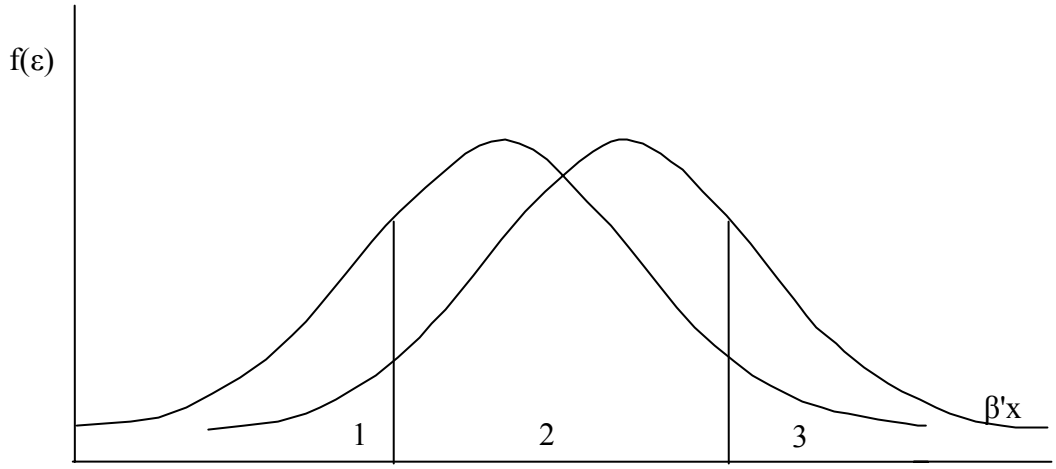


Figure 6.2. Effects of Change in *x* on Predicted Probabilities

6.2 Results

6.2.1 Descriptive Results

Homeowners were asked to rank their preferences for different levels of termite control options. The details of these options as presented in the questionnaire are as follows:

Alternative 1: Homeowners do not engage in any sort of activities, such as contracting with a pest control operator or company, to protect against termites. This option will cost homeowners no money. With no form of termite protection or control, however, the chance that termites will attack the home over the next five years is significant.

Alternative 2: Homeowners contract with a pest control operator or company to install a liquid termite prevention solution (an insecticide that is applied in a trench dug around his/her home) around the exterior of his/her house. The cost of this option is as follows (based on hypothetical 2000 square foot home): initial inspection and installation fee of a $750 and annual renewal fees of $113 per year (including the first year). This equates to an average cost over the next five years of $0.13 per square foot per year. With this service, the homeowner will receive one home inspection per year. The contract lasts for five years.

Alternative 3: Homeowners contract with a pest control operator or company to install a termite baiting system around the house to assist in preventing termite infestation (small, self-contained insecticide bait stations are placed into the ground around the perimeter of the house). The cost of this option is as follows (based on a hypothetical 2,000 square foot house): initial inspection and installation fee of $2,000 and annual renewal fee of $450 per year (including the first year). This equates to an average cost over the next five years of $0.43 per square foot per year. With this service, the homeowners will receive a minimum of one inspection per month. The contract lasts for five years.

Alternative 4: Homeowners contract with a pest control operator or company to install a liquid termite prevention solution around the exterior of the house plus a termite bait system, which further prevents termites. The cost of this option is as follows (based on a hypothetical 2000 square foot home): initial inspection and installation fee of $2750, annual renewal fees of $563 per year (including the first year). This equates to an average cost over the next five years of $0.56 per square foot per year. With this service, homeowners will receive a minimum of one inspection per month. The contract lasts for five years.

Altogether, 972 respondents ranked their preferences for the termite control options. Out of these respondents, only 747 (77%) ranked all four alternatives (Table 6.1). Approximately one-fifth (22.8%) of the respondents chose 'do nothing' for termite control as their most preferred alternative. The remaining 77% of respondents wanted termite control and were willing to pay for it. Similarly, 52%, 13%, and 13% of respondents preferred Alternatives 2, 3, and 4 as their most preferred alternatives. More than 70% (n=747) of respondents chose the 'do nothing' option as their least preferred alternative. More than 27% of respondents chose the most costly alternative (Alternative 4) as their least preferred alternative (Figure 6.3).

Table 6.1 presents respondents' orderings of preferences for termite control options. More than 19% of respondents did not want to pay for termite control. More than 53.5% of respondents preferred Alternative 1 as their first preference. This option costs $0.13 per square foot per year. Approximately 12.7% of respondents ranked Alternative 3 as their first preference. This option costs $0.43 per square foot per year. The other 15% of respondents chose Alternative 4 as their first preference. This option costs $0.56 per square foot per year.

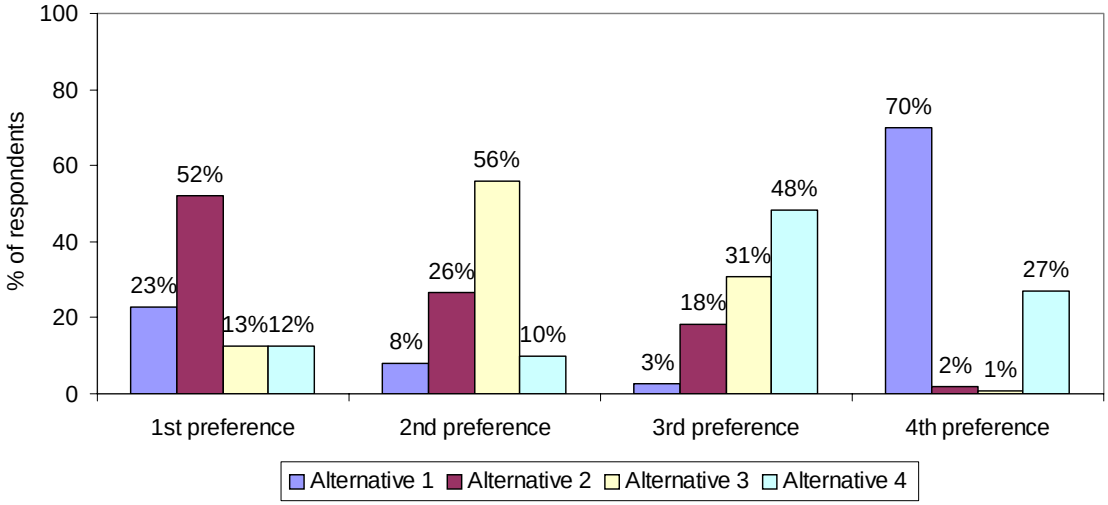


Figure 6.3. Homeowners' Preference Ranking for Termite Control Options

Table 6.1. Frequency Distribution of Contingent Ranking for Complete Ordering (n=747)

Preference order	Frequency	Percent
1>2>3>4	123	16.5
1>2>4>3	1	0.1
1>3>2>4	6	0.8
1>3>4>2	4	0.5
1>4>2>3	1	0.1
1>4>3>2	7	0.9
2>1>3>4	55	7.4
2>1>4>3	1	0.1
2>3>1>4	15	2
2>3>4>1	305	40.8
2>4>3>1	24	3.2
2>4>1>3	0	0
3>1>2>4	1	0.1
3>1>4>2	1	0.1
3>2>1>4	2	0.3
3>2>4>1	48	6.4
3>4>1>2	2	0.3
3>4>2>1	39	5.2
4>1>2>3	2	0.3
4>2>1>3	2	0.3
4>2>3>1	20	2.7
4>3>2>1	88	11.8
4>3>1>2	0	0
4>1>3>2	0	0
Total	747	99.9

6.2.2 Ordered PROBIT Results

The variables used in this model and their means and standard deviations are presented in Table 6.2. An ordered PROBIT regression model was estimated for the four control options ranging from no control, low-level control, medium-level control and high-level control. LIMDEP Version 7 was used to estimate the model parameters. The results are presented in Table 6.3 through Table 6.5 and are discussed below.

Table 6.2. Description of Variables

Variable	Description	Mean	Std. Deviation
1. Homeownership			
LOCATION1	Survey location Monroe (1=yes)	0.25	0.43
LOCATION2	Survey location Alexandria (1=yes)	0.22	0.41
LOCATION3	Survey location Baton Rouge (1=yes)	0.28	0.45
OWNLENGTH1	Length of home ownership <5 year (1=yes)	0.22	0.41
OWNLENGTH2	Length of home ownership 6-10 years (1=yes)	0.19	0.39
OWNLENGTH3	Length of home ownership 11-15 years (1=yes)	0.13	0.33
OWNLENGTH4	Length of home ownership 16-20 years (1=yes)	0.1	0.31
LIVSPACE1	Home-living space <1,500 square feet (1=yes)	0.18	0.39
LIVSPACE2	Home-living space 1,500-1,999 square feet (1=yes)	0.33	0.47
LIVSPACE3	Home-living space 2,000-2,999 square feet (1=yes)	0.31	0.46
MKTVAL1	Home's market value <$50K (1=yes)	0.08	0.27
MKTVAL2	Home's market value $50-$99K (1=yes)	0.33	0.47
MKTVAL3	Home's market value $100-$199K (1=yes)	0.36	0.48
MKTVAL4	Home's market value $200-$299K (1=yes)	0.1	0.29
HOMCONST1	Wood frame house with wood siding (1=yes)	0.15	0.36
HOMCONST2	Wood frame house with non-wood siding (1=yes)	0.73	0.44
HOMCONST3	Others (1=yes)	0.09	0.29
HOMSELL	Plan to sell home in future (1=yes)	0.32	0.47
2. Knowledge of termites			
TERMFND	Termites found in home (1=yes)	0.39	0.48
TERMNEIGH	Termites –an existing problem in neighborhood (1=yes)	0.46	0.5
FSTHEARD	Heard of FST (1=yes)	0.75	0.43
TERMCONT	Have a termite control contract (1=yes)	0.47	0.5
3. Socio-demography			
GENDER	Female (1=yes)	0.41	0.49
AGE	Age of respondent in years	55.2	14.4
AGESQ	Age squared	3258	1641
EDUCATION1	Education: some high school or less (1=yes)	0.04	0.19
EDUCATION2	Education: high school graduate (1=yes)	0.19	0.39
EDUCATION3	Education: some college (1=yes)	0.27	0.44
EDUCATION4	Education: college graduate (1=yes)	0.24	0.43
INCOME1	Income: <$40K (1=yes)	0.28	0.45
INCOME2	Income: $40K-79K (1=yes)	0.3	0.46
INCOME3	Income: $80K-124K (1=yes)	0.15	0.36
ETHNIC	Caucasian (1=yes)	0.79	0.4

Table 6.3 provides the estimation results of the ordered PROBIT model. Table 6.4 provides the marginal effect of each variable. Table 6.5 provides the predictability of the model. Threshold parameters μ_1 and μ_2 were significant at the 1% level. The relationship of threshold $0< \mu_1 < \mu_2$ was also confirmed. Significant positive and ordinal μ estimates indicate that the four alternatives were ordered.

Since the dependent variable (termite control option) increases from 1 to 4, positive coefficients suggest the likelihood of choosing a higher level of control. Only the variables COST, VISIT, and LIQUID were found to be significant. However, the sign of each variable may give the direction of the control level for that particular variable.

The negative sign of cost shows that there is a negative relationship between cost and level of control. That means as the cost of a control option increases, the likelihood of choosing a lower control options increases. Although insignificant, a respondent whose length of home ownership was within 5 to 20 years, whose living space was between 2,000 and 3,000 square feet, had a garage and a concrete slab foundation, who had heard of the FST, who was female, and who was relatively older was more inclined to choose a higher control option.

Likewise, a respondent from Alexandria or Baton Rouge, who owned a single-family house with 1,500 and 2,000 square feet of living space, of wood frame construction with non-wood siding whose estimate home market value of less than $400,000, whose home is mortgaged, who attained education level of college graduate or less, who has a pre-tax annual household income of less than $20,000, and who was Caucasian, was more likely to choose a lower level of termite control. The signs of INFTYPE2 and TERMNEIGH2 were unexpected. Respondents whose homes were infested with FST (INFTYPE2) were expected to choose a

higher level of termite control. Those who considered termites to be an existing problem in their neighborhoods were expected to choose a higher level of termite control.

Table 6.5 presents the model's power of prediction. The model accurately predicted the first two control options of no control and a low level of control. The model poorly predicted the second two control options. Further interpretations of each variable and analysis of the model's predictive power was beyond the scope of this project and was left as future work.

Table 6.3. Results from Ordered PROBIT Model

Variables	Coefficient	Standard Error	t-value	p-value
LOCATION 2	-5.84E-03	5.38E-02	-0.109	0.9135
LOCATION 3	-1.24E-03	5.02E-02	-0.025	0.9802
COST	-66.72293631	2.6767227	-24.927	0
LIQUID	8.021049765	0.28512674	28.132	0
VISIT	2.491359801	0.10085541	24.702	0
HOMTYPE	-2.27E-02	6.41E-02	-0.354	0.7234
OWNLENGTH2	1.91E-03	5.31E-02	0.036	0.9713
OWNLENGTH3	5.16E-03	6.47E-02	0.08	0.9364
OWNLENGTH4	3.66E-03	7.28E-02	0.05	0.9599
LIVSPACE2	-4.85E-04	5.57E-02	-0.009	0.9931
LIVSPACE3	9.17E-04	5.85E-02	0.016	0.9875
GARAGE	1.62E-05	2.92E-04	0.055	0.9558
HOMCONST2	-1.00E-02	5.16E-02	-0.194	0.846
HOMFOUND	1.32E-05	1.49E-04	0.088	0.9296
MKTVAL2	-2.59E-02	7.66E-02	-0.338	0.7356
MKTVAL3	-3.01E-02	8.15E-02	-0.369	0.7119
MKTVAL4	-2.71E-02	9.88E-02	-0.274	0.7838
MKTVAL5	-4.41E-02	8.93E-02	-0.494	0.6214
MORTG	-5.99E-06	3.81E-04	-0.016	0.9875
HOMSELL	8.79E-06	2.93E-04	0.03	0.976
INFTYPE2	-1.34E-02	0.11396905	-0.118	0.9064
TERMNEIGH2	-1.44E-02	4.36E-02	-0.33	0.7416
FSTHEARD	4.56E-05	2.52E-04	0.181	0.8566
CHEMUSE4	-5.05E-03	4.14E-02	-0.122	0.9029
GENDER	1.10E-05	2.07E-04	0.053	0.9578
AGE	5.46E-06	1.45E-04	0.038	0.9699
EDUCATION1	-2.00E-04	0.18546089	-0.001	0.9991
EDUCATION3	-4.29E-03	5.17E-02	-0.083	0.9339
EDUCATION4	-3.68E-03	4.92E-02	-0.075	0.9405
INCOME1	-8.12E-03	5.57E-02	-0.146	0.8841
ETHNIC	-2.83E-06	1.38E-04	-0.02	0.9837
Threshold parameters for index				
Mu(1)	0.882211255	3.15E-02	28.008	
Mu(2)	1.654228289	3.59E-02	46.117	

Note: N=2,968; model chi-square (30 *df*) = 1009.3. μ_1 and μ_2 are threshold parameters.

Table 6.4. Marginal Effects

Variable	Y=0	Y=1	Y=2	Y=3
LOCATION2	0.0017	0.0007	-0.0007	-0.0017
LOCATION3	0.0004	0.0001	-0.0001	-0.0004
COST	18.905	7.6735	-7.6687	-18.9098
LIQUID	-2.2726	-0.9225	0.9219	2.2732
VISIT	-0.7059	-0.2865	0.2863	0.7061
HOMTYPE	0.0064	0.0026	-0.0026	-0.0064
OWNLEN2	-0.0005	-0.0002	0.0002	0.0005
OWNLEN3	-0.0015	-0.0006	0.0006	0.0015
OWNLEN4	-0.001	-0.0004	0.0004	0.001
LIVSPACE2	0.0001	0.0001	-0.0001	-0.0001
LIVSPACE3	-0.0003	-0.0001	0.0001	0.0003
GARAGE	0	0	0	0
HOMCOD2	0.0028	0.0012	-0.0012	-0.0028
HOMFOUND	0	0	0	0
MKTVAL2	0.0073	0.003	-0.003	-0.0073
MKTVAL3	0.0085	0.0035	-0.0035	-0.0085
MKTVAL4	0.0077	0.0031	-0.0031	-0.0077
MKTVAL5	0.0125	0.0051	-0.0051	-0.0125
MORTG	0	0	0	0
HOMSELL	0	0	0	0
INFTYPE2	0.0038	0.0015	-0.0015	-0.0038
TERMNEIGH2	0.0041	0.0017	-0.0017	-0.0041
FSTHEARD	0	0	0	0
CHEMUSE4	0.0014	0.0006	-0.0006	-0.0014
GENDER	0	0	0	0
AGE	0	0	0	0
EDUCATION1	0.0001	0	0	-0.0001
EDUCATION3	0.0012	0.0005	-0.0005	-0.0012
EDUCATION4	0.001	0.0004	-0.0004	-0.001
INCOME1	0.0023	0.0009	-0.0009	-0.0023
ETHNIC	0	0	0	0

Table 6.5. Model Predictability

	Predicted				
Actual	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Total
Alternate 1	521	201	0	20	742
Alternate 2	21	357	32	332	742
Alternate 3	59	73	94	516	742
Alternate 4	141	111	28	462	742
	742	742	154	1,330	2,968

CHAPTER 7: SUMMARY AND CONCLUSION

The control and prevention of Formosan subterranean termites in Louisiana is an imminent issue. This insect is damaging not only homes but also railroad ties, pilings, utility poles, and even live trees. The FST causes the most notable damage in the French Quarter of New Orleans.

Homeowner engagement is very important for prevention and control of the FST. However, homeowners' attitudes and perceptions about the FST ever unknown in Louisiana as elsewhere in the United States. This study addressed some of the key questions related to homeowners' attitudes and perceptions about termites: what were homeowners' awareness levels regarding the FST, where and to what extent did the FST problem exist, who and what were the most vulnerable groups or areas, what were homeowners' control preferences, and how much they were willing to pay for termite control. This study also examined the factors that influence homeowners' choice regarding termite control.

The overall objectives of this study were to: (1) identify the attitudes and awareness levels of Louisiana homeowners about the FST in the state and look at those factors that influence homeowner attitudes and perceptions, (2) identify homeowners' termite control preferences in Louisiana, (3) identify the determinants that influence homeowners' preferences for termite control options, and (4) estimate the individual homeowner's willingness-to-pay for termite control.

The survey instrument was developed in four sections. The first section comprised questions about home and home ownership. This section asked homeowners their home type, how long they had owned it, living space, market value, type of home construction and foundation, and plans for selling their homes. The majority of respondents lived in single-family

homes (90.5%), had owned their current home for more than 20 years (59%), and lived in homes that had 1,500 to 3,000 square feet of living space (67%). Seventy-two percent of respondents estimated their home's market value to be between $50,000 and $200,000. About three-fourths of them (75%) indicated their houses were wood frame with non-wood siding. More than one-half (58%) of respondents had mortgages on their homes and about two-thirds (68%) indicated they did not have any plans for selling their homes within 10 years.

The second section of the survey was made up of questions related to homeowners' knowledge of termites. In this section respondents were asked :had they had found termites found termites in their homes, estimates of damage amounts, infestation types, whether or not they considered termites to be an existing problem in their neighborhoods, whether or not they had a termite control contract, and whether or not they had heard of the FST. More than 39% of respondents had found termites in their homes either during their ownership or when the homes were under previous ownership. New Orleans had the highest proportion (61%) of respondents who had found termites in their homes, followed by Baton Rouge (38%), Monroe (30%), and Alexandria. A higher proportion of respondents (56%) who had found termites in their homes also owned wood frame houses with solid wood siding, compared to respondents owning wood frame houses with non-wood siding (37%). Termites found in the homes were also related to the type of foundation. The proportion of termite-infested homes was higher in raised constructed houses than in those with concrete slab foundations. More than 45% of respondents whose homes were infested did not know the type of termite. This clearly showed that there was a knowledge gap among respondents regarding termites. Only 13% of respondents reported their houses were infested by Formosan subterranean termites. The other 32.3% and 6% of

respondents reported native subterranean termite and drywood termite infestations in their homes. Another 2.5% of the respondents reported more than two types of termite infestation.

About one-half of 1,205 respondents (46%) considered termites an existing problem in their neighborhoods. The results showed that knowledge and attitudes about neighborhood termite problems was strongest in New Orleans (76%), followed by Baton Rouge (41%), Alexandria (38%), and Monroe (31%). New Orleans respondents might have more information about termites than any other areas, especially among people who had found termites in their homes, whose homes were wood frame with solid wood siding, whose homes were of high value, who were more educated and earned higher incomes.

About one-half (47%) of respondents had a termite control contract. New Orleans had the highest proportion (59%) of respondents with such contracts followed by Baton Rouge (53%), Monroe (39%), and Alexandria (34%). In general, purchase of termite control contracts was found to be prevalent among male, Caucasians respondents with higher incomes and whose houses had concrete slab foundations.

Sixty-five percent of the respondents estimated the damage caused by termites to be less than $2,500, while 23% of respondents reported their damage to be more than that. Seventeen percent of damage reported by respondents was covered by a termite contract warranty. A majority of respondents (71%) reported that they bore the damage costs themselves.

The vast majority of respondents (75%) reported that they had heard of Formosan Subterranean Termites. As expected, New Orleans had the highest proportion (89%) of respondents who had heard of the FST, followed by Baton Rouge (83%), Monroe (68%), and Alexandria (54%). An educated Caucasian male respondent who found termites in his home, and had a termite contract, who earned a higher income was more likely to have heard of the FST.

The third section of the survey was composed of questions related to ranking termite control options, willingness-to-pay for termite control, rating the use of different criteria for a contract with a pest control service, evaluating the amount of chemical use in Louisiana, and rating the level of trust they held in different agencies.

Regarding termite control options, the survey presented four distinct control options. Approximately 23% of respondents chose alternative one as their first preference: not engaging in any sort of termite-controlling activities. Hence, this option cost homeowners no money. The majority of respondents (52%) chose the second control option as their first preference. In this option there was a $750 initial installation fee and a $113 annual renewal fee, for an average cost of $0.13 per square foot per year for a contract period of five years. Approximately 12.5% of respondents chose alternative three as their first preference with an initial installation fee of $2,000 and an annual renewal fee of $450 to install a baiting system around the house. This equates to $0.43 per square foot per year for a five-year contract period. Approximately 12.5% of respondents chose alternative four as their first preference: a $2,750 initial installation fee and a $563 annual renewal fee for installing a liquid and a bait termite prevention system. This cost an average of $0.56 per square foot per year for a five-year contract period.

Alexandria had the highest proportion (30%) of respondents who chose no control option as their first alternative, followed by Monroe and Baton Rouge (28%), and New Orleans (13%). Similarly, New Orleans had the highest proportion (44%) of respondents for whom alternative 4 was the first option, followed by Baton Rouge (27%), Alexandria (16%), and Monroe (13%). A higher level of control was more likely to be chosen by a more educated, higher income person who considered termites were already a problem in his/her neighborhood and had a termite contract.

More than 26% of respondents showed they were willing to pay more than $0.56 if there was a 100% guarantee of termite protection. The estimated average hypothetical WTP for a homeowner was $0.32 per square foot per year, whereas the average existing contract cost (real WTP) for a homeowner was $0.16. New Orleans had the highest hypothetical WTP ($0.38) per square foot per year, followed by Monroe ($0.30) and Alexandria ($0.30), and Baton Rouge ($0.29). Similarly, existing contract cost (real WTP) was highest for New Orleans ($0.17), followed by Baton Rouge ($0.15), Alexandria ($0.14), and Monroe ($0.13).

Homeowners were asked to rate different criteria such as cost, quality of service, responsiveness, whether or not treatment was successful, guarantee, length of contract, recommendation of friends, and information from advertisements that they would be use to decide on pest control contract. They rated the four most important criteria treatment success, followed by guarantee, quality of service, and cost.

Homeowners were asked to rate their level of trust in seven different agencies about their ability to provide information and guidance about the safety, effectiveness, and application standards of the chemicals used to control termites. The LSU AgCenter was the most trusted, followed by the Louisiana Department of Agriculture and Forestry, the U.S. Department of Agriculture, the U.S. Environmental Protection Agency, the Louisiana Department of Environmental Quality, the pest control industry and local government.

The last section of the questionnaire was made up of socio-demographic questions. Homeowners were asked their gender, age, marital status, education, income, and ethnic background. More than one-half (59%) of respondents were male. The average age of respondents was 55 years and a majority of them (70%) were married or living with a partner. Homeowners were well educated, as over three-quarters (75%) had completed some college

courses or studied at a higher level. The majority of respondents' annual pre-tax household income was between $20,000 and $100,000.

Three different models were used for estimation. First, ordinary least squares regression was used to model hypothetical and real willingness to pay. Second, a logistic model was used to model the yes/no response for whether or not homeowners were willing to pay more than $0.56 per square foot per year for termite control if it 100% guaranteed to prevent termites. Third, an ordered PROBIT model was used for modeling respondents' ranking of different termite control options.

The results of the OLS regression model suggested that length of home ownership, living space, market value of home, whether or not homeowners considered termites to be an existing problem in their neighborhoods, whether or not homeowners had a termite contract, homeowners' gender, income, and ethnic background were significant determinants of a homeowner's willingness to pay. The hypothetical bias was attributed to length of home ownership, living space, whether or not homeowners considered termites were already a problem in their neighborhoods, and income.

With the logistic model, the length of home ownership, market value of home, owners' gender, income and ethnic background were significant determinants in his/her answer about willingness to pay more than $0.56 per square foot per year for termite control that was 100% guaranteed to prevent termites.

Only cost of treatment, number of visits by the pest control service, and use of liquid treatment were significant determinants in respondents' choices for termite control in the ordered PROBIT model.

7.1 Limitations of Study

For this study, only four metropolitan areas were surveyed. This study was limited to homeowners, but there could be other customers for termite control such as termite control operators, government agencies, businesses, renters and others. The important assumption constraining this study was living space in the home, which respondents were not always able to estimate. Living space square footage was the basis for the willingness to pay question. Respondents might have felt more confident in stating their willingness to pay based on a lump sum payment for their whole house rather than a per-unit payment.

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APPENDIX 1: THE SURVEY QUESTIONNAIRE

Dear Louisiana Home Owner,

We are conducting a study to better understand Louisiana homeowner perceptions about termites. The survey is **completely confidential** and **only summary information** will be reported in study results. The number at the top of this survey is an identifier only that allows us to track when we receive your completed survey, ensuring that you do not receive subsequent surveys or phone calls.

When you have completed the survey, please put it in the **postage paid envelope** and return to us.

Thank you.

Michael A. Dunn
Associate Professor, Economics
Louisiana State University
Agricultural Center

Richard Vlosky
Professor, Forest Products Marketing
Louisiana State University
Agricultural Center

Home Ownership

1. Do you own the dwelling that this survey was addressed to? (Please circle one response).

   A. NO → **If NO, please place this survey in the postage-paid envelope and return it to us**.

   B. YES → If YES, please continue with the rest of the survey.

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2. Which best describes the house you own where you received this survey? (Please circle one response)

   1) Single family house
   2) Multi-family house
   3) Apartment
   4) Condominium
   5) Townhouse

3. How long have you owned your current home? (Please circle one response)

   1) Less than 1 year
   2) 1-5 years
   3) 6-10 years
   4) 11-15 years
   5) 16-20 years
   6) More than 20 years

4. Please estimate the living space of your home in square feet? (Please circle one response)

   1) 0-1,499 square feet
   2) 1,500-1,999 square feet
   3) 2,000-2,999 square feet
   4) 3,000 square feet or more

5. Does your home have a garage? (Please circle one response)

   1) No
   2) Yes

6. Please estimate the approximate current market value of your home (Please circle one response)

   1) $0-$49,999
   2) $50,000-$99,999
   3) $100,000-$199,999
   4) $200,000-$299,999
   5) $300,000-$399,999
   6) $400,000-$499,999
   7) $500,000 or greater

7. How would you best describe your home's construction? (Please circle one response)

   1) Wood frame house with solid wood siding
   2) Wood frame house with non-wood siding (aluminum, vinyl, brick, pressboard)
   3) Steel framed
   4) Concrete block construction
   5) Pre-fabricated manufactured home
   6) Trailer home
   7) I don't know
   8) Other (please specify)_____

8. How would you describe your home's foundation? (Please circle one response)

   1) Concrete slab
   2) "Raised" construction (home sits above ground and does not have a concrete slab)
   3) I don't know

9. Do you currently have a mortgage on your home? (Please circle one response)

   1) No
   2) Yes

   9a. If YES, what is the mortgage total length in years? _____ YEARS
   9b. If YES, approximately how many years do you have left to pay off the mortgage? _____ YEARS

10. Do you plan to sell your home at any point in the future? (Please circle one response)

    1) No
    2) Yes

    10a. If YES, when do you plan to sell your home? (Please circle one response)

       1) In the next 6 months
       2) In 6 months- 1 year
       3) 2-5 years from now
       4) 6-9 years from now
       5) 10 years or later

    10b. If YES, why are you planning to sell your home? (Please check ALL that apply).

       _____1) I have a new job and need to move
       _____2) Taxes are too high
       _____3) Termite problems
       _____4) Retirement
       _____5) Other (Please specify): _____

Termites

1. To the best of your knowledge, have termites of any kind ever been found in your home? (Please circle one response)

   1) No
   2) Yes

   1a. If YES, have termites been found in your home while you have been the owner? (Please circle one response)

      1) No
      2) Yes

   1b. If YES, in what year(s) were termites found in your home? (Please indicate all years that termites were found). _____

2. If termites have caused damage to your home while you have been the owner, please estimate the total dollar amount of damage. (Please check the most applicable response)

   _____ $0 - $2,499
   _____ $2,500 - $4,999
   _____ $5,000 - $7,499
   _____ $7,500 - $9,999
   _____ $10,000 - $12,499
   _____ $12,500 - $14,999
   _____ $15,000 - $17,499
   _____ $17,500 - $19,999
   _____ $20,000 or greater
   _____ I do not know how much the damage cost

3. If termites have caused damage to your home while you have been the owner and you had a termite control contract, were the costs associated by the damage covered by the contract warranty or were the expenses paid by you out of pocket? (Please circle one answer)

   1) Covered by termite protection warranty
   2) Paid for by me out of my own pocket
   3) I don't know

4. If termites have been found in your home, please signify which type of termite infestation occurred. (Please circle one answer)

   1) Native Subterranean Termite
   2) Formosan Subterranean Termite
   3) Drywood Termite
   4) I don't know

5. In general, do you consider termites to be an existing problem for homeowners in your neighborhood? (Please circle one response)

   1) No
   2) Yes
   3) I don't know

6. Do you currently have a termite prevention/control contract with a professional pest control operator or company? (Please circle one response)

   1) Yes
   2) No (If "no" please skip to question 6d)

   6a. If YES, please estimate how much you paid for an **initial installation fee**. This fee is usually applied up front, at the start of the service period. (Please circle one response)

      1) $0 - $400 installation fee
      2) $401 - $800 installation fee
      3) $801 - $1,200 installation fee
      4) $1,201 - $1,600 installation fee
      5) $1,601 - $2,000 installation fee
      6) Installation fee was greater than $2,000.
      7) I do not know how much the installation fee was

   6b. If YES, please estimate how much you pay for an **annual renewal fee**.
      1) $0 - $99 annual renewal fee
      2) $100 - $199 annual renewal fee
      3) $200 - $299 annual renewal fee
      4) $300 - $399 annual renewal fee
      5) $400 or greater renewal fee
      6) I do not know how much the renewal is

   6c. If YES, what does the warranty associated with your termite control contract cover? (Please circle one response)
      1) Re-treatment only
      2) Re-treatment plus payment for damages to structure resulting from termite infestation
      3) I don't know

   6d. If NO, do you plan to purchase a termite prevention service contract in the next year? (Please circle one response)

      1) No
      2) Yes
      3) I don't know

7. Have you ever heard of the Formosan Subterranean Termite? (Please circle one response)

   1) No
   2) Yes

   7a. If yes, where did you hear about the Formosan Subterranean Termite? (Please check all that apply):

      1) Television
      2) Radio
      3) Newspaper
      4) Friends
      5) Pest Control Service
      6) Extension Service
      7) Government Agency
      8) Other (please specify) _____

Formosan Subterranean Termites

Please read the following general information about the Formosan Subterranean Termite

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The Formosan subterranean termite was first discovered in the United States in Lake Charles and New Orleans in 1966[1]. It is suspected that the Formosan subterranean termite was introduced into the United States on ships returning from the Pacific after World War II. Formosan subterranean termites now exist in Louisiana, California, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, Tennessee, Texas, and Hawaii.

The Formosan is considered a "super termite". One Formosan termite colony can reach over ten million individuals, compared to "normal" or native termite colonies, which typically range between 200,000 and 1 million individuals. Formosan termites are very aggressive. They often make above ground carton nests which hold water. This makes the termites more difficult to control.

Formosan subterranean termite numbers are estimated to have increased over 2000% between 1989 and 1998. It is also estimated that the Formosan causes $300 million in damage annually in the Greater New Orleans Metropolitan Area alone and over $1 billion in damage annually nationwide.

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1. There are different alternatives that homeowners can choose to protect their homes from Formosan Subterranean Termites. We'd like you to evaluate and rank your preferences from the alternatives listed below. Please indicate your ranking selection on the "Rank" space.

   1= First preference
   2= Second preference
   3= Third preference
   4=Fourth preference

Rank

____ **Alternative 1** Do not engage in any sort of activities, such as contracting with a pest control operator or company, to protect against termites. This option will cost you no money. With no form of termite protection or control, however, the chance that your home will be attacked by termites over the next five years is significant.

____ **Alternative 2** Contract with a pest control operator or company to install a liquid termite prevention solution (an insecticide that is applied in a trench dug around your home) around the exterior of your house. The cost of this option is as follows (based on a hypothetical 2,000 square foot home): initial inspection and installation fee = $750, annual renewal fees = $113 per year (including first year). This equates to an average cost over the next five years of $0.13 (thirteen cents) per square foot per year. With this service you will receive one home inspection per year. The contract lasts for five years.

____ **Alternative 3** Contract with a pest control operator or company to install a termite baiting system around the exterior of your home (small, self-contained insecticide bait stations are placed into the ground around the perimeter of your house) to assist in preventing termite infestation. The cost of this option is as follows (based on a hypothetical 2,000 square foot home): initial inspection and installation fee = $2,000, annual renewal fees = $450 per year (including the first year). This equates to an average cost over the next five years of $0.43 per square foot per year. With this service you will receive a minimum of one inspection per month.. The contract lasts for five years.

____ **Alternative 4** Contract with a pest control operator or company to install a liquid termite prevention solution around the exterior of your house PLUS a termite bait system which further prevents termites. The cost of this option is as follows (based on a hypothetical 2,000 square foot home): initial inspection and installation fee = $2,750, annual renewal fees = $563 per year (including the first year). This equates to an average cost over the next five years of $0.56 (fifty-six cents) per square foot per year. With this service you will receive a minimum of one inspection per month. The contract lasts for five years.

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[1] Shupe, T.F. and M.A. Dunn. 2000. The Formosan Subterranean Termite in Louisiana: Implications for the Forest Products Industry. *Forest Products Journal* Vol 50, No. 5. pp 10-18.

2. Would you be willing to pay more than $0.56 (fifty-six cents) per square foot per year for termite prevention that is 100% guaranteed to prevent termites for as long as you plan to own your home? (Please circle one response)

   1) No
   2) Yes

   2a. If NO, what is the maximum amount you would be willing to pay? (Please write your answer in the space provided) _____ dollars per square foot per year.

   2b. If YES, what is the maximum amount you would be willing to pay? (Please write your answer in the space provided) _____dollars per square foot per year.

3. Please rate each of the following selection criteria that you would use in contracting with a pest control service. (Please circle one number per line)

	Very Unimportant	Unimportant	Neither Important nor Unimportant	Important	Very Important
▪ Cost	1	2	3	4	5
▪ Quality of Service	1	2	3	4	5
▪ Responsive	1	2	3	4	5
▪ Treatment is successful	1	2	3	4	5
▪ Guarantee	1	2	3	4	5
▪ Length of contract	1	2	3	4	5
▪ Recommendation of friends	1	2	3	4	5
▪ Information from advertisement	1	2	3	4	5

4. What is your evaluation regarding the amount of chemicals that are being used to fight termites and other insect pests in Louisiana? (Please circle one answer)

   1) Not enough used
   2) Right amount is being used
   3) Too much is being used
   4) I don't know
   5) I don't care

5. From the list below, please rate your level of trust of the sources below as to their ability to provide information and guidance about the safety, effectiveness, and application standards of the chemicals used to control termites. Please circle one number per line.

AGENCIES	Do Not Trust At All	Distrust Somewhat	Neither Trust Nor Distrust	Trust Somewhat	Trust Completely	I don't know who or what this is
United States Environmental Protection Agency	1	2	3	4	5	6
United States Department of Agriculture	1	2	3	4	5	6
Louisiana Department of Environmental Quality	1	2	3	4	5	6
Local Government	1	2	3	4	5	6
Louisiana Department of Agriculture and Forestry	1	2	3	4	5	6
Pest Control Industry	1	2	3	4	5	6
LSU AgCenter and/or Louisiana Cooperative Extension Service County Agents	1	2	3	4	5	6

Please Tell Us More About Yourself

Remember, your responses are **completely confidential**. If you feel uncomfortable answering questions in this section, please complete the rest of the survey and return it. Thank you.

1. Your gender? _____ Female _____ Male

2. Your age? _____ Years Old

3. Your marital status? (Please check one response)

_____1) Never married
_____2) Divorced or separated
_____3) Widowed
_____4) Married or living with partner

4. What is your level of education? (Please check highest level reached.)

_____1) Some high school or less
_____2) High school graduate
_____3) Some college
_____4) College graduate (B.A./B.S.)
_____5) Graduate degree / professional Degree (M.S./Ph.D./JD/ MD)

5. What is your estimated TOTAL annual pretax household income? (Please check the appropriate response)

___ Under $20,000
___ $20,000 - $39,999
___ $40,000 - $59,999
___ $60,000 - $79,999
___ $80,000 - $99,999
___ $100,000 - $124,999
___ $125,000 - $149,000
___ Over $150,000

6. What is your ethnic group? (*Please check only one.)*

___ Caucasian
___ African-American
___ Native American (Indian, Eskimo)
___ Asian or Pacific Islander
___ Hispanic
___ Other

Please return this survey by placing it in the ***postage paid*** envelope and dropping it in the nearest mailbox. Your response has insured that this study will be a success. Thank you for your cooperation and time in completing this survey.

If you have any questions about this survey, please contact Mike Dunn, Associate Professor, Economics, School of Renewable Natural Resources, Louisiana State University, Baton Rouge, LA 70803; Phone: (225) 578-4087 Fax: (225) 578-4227; email: mdunn@agcenter.lsu.edu

APPENDIX 2: LETTER INCLUDED IN THE PRE-TESTING OF QUESTIONNAIRE

Dear Louisiana Homeowner:

You have been randomly chosen out of millions of Louisiana homeowners to test a survey that will be administered by the Louisiana State University Agricultural Center. The survey will question participants on their attitudes and opinions regarding termite control in Louisiana. Your part in this process is extraordinarily critical, for we are asking you to complete the survey and note whether or not there are questions or comments in the survey that are unclear to you.

As you complete the survey, if there is something you do not understand, please write on the survey the questions or comments you have that would make the survey more understandable.

Once completed, simply place the survey in the provided postage paid envelope and return to us. If you have any questions, please contact Dr. Mike Dunn, LSU AgCenter, at 225-578-4087 or email mdunn@agctr.lsu.edu.

Thank you in advance for participating in this important process.

Sincerely,

Michael A. Dunn
Associate Professor, Resource Economics
Louisiana State University Agricultural Center

APPENDIX 3: PRE-NOTIFICATION LETTER

November 5, 2002

Dear Louisiana Homeowner:

In one week a questionnaire will be sent to you seeking your opinions on termites and termite control efforts in Louisiana. Because the questionnaire will be sent to only a small sample of people in Louisiana, it is extremely important that your thoughts, opinions, and experiences be included in this study. Your valuable contribution will ensure that the results of the study accurately reflect homeowners in Louisiana. **The survey is completely anonymous and confidential and only summary information will be reported in study results**.

Upon receipt of a completed survey, we will check your name off our list to ensure that you do not receive subsequent surveys or phone calls.

If you have any questions about the research study, please call me at (225) 578-4087, fax (225) 578-4227, or email mdunn@agctr.lsu.edu.

Sincerely,

Michael A. Dunn
Associate Professor, Resource Economics
Louisiana State University Agricultural Center

APPENDIX 4: LETTER INCLUDED IN THE FIRST MAIL OUT

November 12, 2002

Dear Louisiana Homeowner:

This survey is designed to collect information about your opinions on termites and termite control efforts in Louisiana. Currently, little information is known about beliefs, attitudes, and willingness to pay for termite control measures. To adequately characterize these issues, we need your thoughtful responses. By completing this survey, you will help us to better understand these issues.

The survey is designed for easy completion. You are asked to circle a number, check a response or fill in a blank for most questions.

The survey is **completely anonymous and confidential** and only summary information will be reported in study results. The number at the top of this survey is an identifier only that allows us to track when we receive your completed survey, ensuring that you do not receive subsequent surveys or phone calls.

If you have any questions about the research study, please call me at (225) 578-4087 or fax (225) 578-4227.

When you have completed the survey, please place it in the enclosed postage paid envelope.

I thank you most sincerely for your help on this study.

Michael A. Dunn

Associate Professor
Resource Economics
Louisiana State University Agricultural Center

APPENDIX 5: REMINDER POST CARD

November 19, 2002

Dear Louisiana Homeowner:

Last week I mailed you a questionnaire seeking your opinions on termites and termite control efforts in Louisiana. If you have already completed and returned the questionnaire, please accept our sincere thanks. If not, please do so today. Your response is important to the success of this study. **The survey is completely anonymous and confidential and only summary information will be reported in study results**.

Upon receipt of a completed survey, we will check your name off our list to ensure that you do not receive subsequent surveys or phone calls.

If you have not received a survey or it has been misplaced, please call me at (225) 578-4087, fax (225) 578-4227, or email mdunn@agctr.lsu.edu, and a new copy will be sent immediately.

Sincerely,

Michael A. Dunn
Associate Professor, Resource Economics
Louisiana State University Agricultural Center

APPENDIX 6: LETTER INCLUDED IN THE SECOND MAIL OUT

December 16, 2002

Dear Sir or Madam:

A few weeks ago I sent you a survey designed to collect information about termites from Louisiana homeowners like yourself.

I did not hear from you. ***Please*** take about 15 minutes to complete the enclosed survey. By completing this survey, you will help us to better understand these issues.

The survey is designed for easy completion. You are asked to circle a number, check a response or fill in a blank for most questions. Only a few questions request written comments.

The survey is **completely confidential** and only summary information will be reported in study results. The number at the top of this survey is an identifier only that allows us to track when we receive your completed survey, ensuring that you do not receive subsequent surveys or phone calls.

If you have any questions about the research study, please call me at (225) 578-2376 or email: mdunn@agcenter.lsu.edu.

When you have completed the survey, please place it in the enclosed **postage paid** envelope.

I thank you most sincerely for your help on this study.

Michael A. Dunn

Associate Professor
Resource Economics
Louisiana State University Agricultural Center

APPENDIX 7: 'OTHER' REASONS FOR SELLING HOME

'Other' reasons for selling home	No. of Respondents
Need larger home	43
Build a new house	7
Age	5
Downsize	4
Kids will be moving out	4
Personal	4
Build a larger home	3
Buying new home	2
Change	2
New house	2
When all my children get married and move out	2
Yard too big to keep up- later in life	2
Another house	1
Better design	1
Better home	1
Bigger family	1
Bought land to build a home	1
Bought new house	1
Build again	1
Buy a larger home	1
Change in life style	1
Crime and criminals in area	1
Crime increasing	1
Death of spouse	1
Divorce	1
Expanding family	1
Family	1
Flip and by new one	1
For smaller home with garage and brick exterior	1
Getting married	1
Getting older hand to keep it up	1
Growing family	1
Hate the climate here and school too	1
Health problems - will leave with daughter	1
Hope to move to another local	1
I hate living in this state	1
If we wee to get transferred	1
Improvement in lifestyle	1
Invest in another	1
Investment	1
Investment reasons	1
Just want another house	1
Location	1
Location more desirable	1

Looking for more property	1
Looking for single family house	1
Lot too large to mow	1
May just want to move to new house	1
More children	1
More living space	1
Move close to daughter	1
Move close to my daughter	1
Move from here	1
Move out of state	1
Move out of state for job	1
Move to a larger house	1
Move to a much bigger yard	1
Move to condo	1
Move to country	1
Move to Mississippi	1
Move to new area	1
Move to smaller, lower maintenance	1
Move to the country	1
Move to the country	1
Moving out of city	1
Moving to country for peace	1
Moving to larger home	1
My husband works fulltime in one town and I work part-time in this town	1
Need a one-floor house	1
Need smaller home	1
Neighbor yard on right	1
New design	1
Newer home	1
Nicer home	1
Not enough to offer in city	1
On deaths or nursing home confinement	1
On of us will die	1
Outgrowing home	1
Outgrowing size of home	1
Planned job move	1
Poor city government	1
Prefer gas rather than electricity	1
Progress	1
Property settlements with ex-wife	1
Public school	1
Realize a profit	1
Relocate	1
Relocate to safer area	1
Relocating to gated community	1
Relocating to other state	1
Schools	1
Sell it and buy another	1

Slab, squirrel, city oak tree problem	1
Smaller house after children leave	1
Smaller house on	1
Smaller house, different area	1
Something bigger	1
Space	1
Starting a family	1
Tired of living in congested area	1
To be near grand children	1
To leave this flood zone	1
To make a profit and buy another house	1
To move further out from city	1
To move out of state	1
To reduce yard maintenance	1
To relocate	1
To take over family business	1
Too large	1
Too large to maintain	1
Unable to find good employment	1
Up grade	1
Upgrade every 7-10 years	1
Upgrade to larger home	1
Upscale	1
Want a new home with more space	1
Want build someday	1
Want less yard	1
Want more land, eventually	1
Want newer home	1
Want newer, bigger	1
Want to build one home further out	1
Want to build own home	1
Want to get a noble home	1
Want to live in the country	1
Want to move another location	1
Want to move to the country	1
We find a place that more readily fits our needs	1
We need another bedroom and bathroom since we had another	1
When children are grown	1
When kids move out	1
Widowed	1
Wife does not like house	1
Wife graduates from college	1
Will need assisted living	1
Will return to Mississippi	1

VITA

Doleswar Bhandari was born on November 15, 1965, in Tehrathum, Nepal. He completed his secondary education at Tri-Mohan Secondary School in 1982. He enrolled in the Institute of Agriculture and Animal Science, Rampur, and received the degree of Bachelor of Science in Agriculture in 1992. He attended University of the Philippines at Los Banos and earned a Master of Management degree in agribusiness management in 1997. Upon completing the master's degree, he was employed at various national and international non-governmental organizations (ECARDS-Nepal, United Nations' Development Program, and Asia Network for Small Scale Bio-resources). In August of 2001, he enrolled in the agricultural economics master's program at Louisiana State University. He is currently a candidate for the degree of Master of Science, which will be conferred in August of 2003.