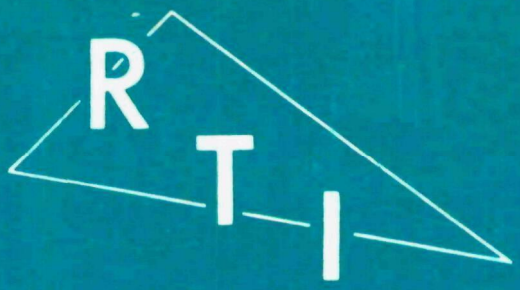

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RTI/1864/18-03F

NATIONAL SURVEY OF HOUSEHOLD PESTICIDE USAGE PILOT STUDY: EXECUTIVE SUMMARY AND OVERVIEW

by

David Budescu
Martin Rosenzweig
Richard Waddell

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Research Triangle Park, NC 27709

Contract No. 68-01-5848
Task 18

Task Manager: John Smith
Project Officer: Linda Deluise

Design and Development Branch
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NATIONAL SURVEY OF HOUSEHOLD PESTICIDE USAGE PILOT STUDY:

EXECUTIVE SUMMARY

I. BACKGROUND

The Pilot Study for the National Survey of Household Pesticide Usage (NHPUS) is in essence a FEASIBILITY STUDY, however the utility of the data is only limited by the variability due to small samples.

- PURPOSE:
  - To ascertain if quantitative and statistically valid data on home pesticide use can be collected.
- OBJECTIVES:
  - To evaluate the survey instrument,
  - To develop and evaluate training and training materials,
  - To determine response rates,
  - To develop cost information,
  - To generate statistical design information for the National Survey.
  - To develop and demonstrate basic analytical methodology.

II. DATA COLLECTION AND ANALYSIS

- PURPOSE:
  - To collect data required to decide if the NHPUS is a feasible project, and if so, to design the National Survey.
- SAMPLE:
  - Three States -- California, Michigan, and Louisiana, each an independent survey in itself covering a range of pesticide usage.
  - States were divided into relatively homogenous pesticide use regions (coastal areas, mountain, lowlands, etc.).
  - Grouping by size of locality was also a factor since needs for major urban areas were expected to be different from small towns.
  - Target sample size by State was 240 households. Number of completed interviews by State: California - 182, Michigan - 179, and Louisiana - 163 (524 total).

- Limited disaggregation of data is possible; a measure of the effect of sample size is shown by number of empty cells in the analysis tables.

• FIELD WORK:

- Data collection period was October 1980.

- Response rate: 80.5%.

- Average cost per interview: $23.12. Eighteen (18) field interviewers and four (4) field supervisors used.

• PROBLEMS ENCOUNTERED:

- Language problems with potential respondents who spoke English poorly or not at all; inadequacies with portions of the training materials; interviewer attrition; inclement weather; and heavy agricultural activity discouraging participation.

- The following data items were difficult to collect: quantity of pesticides used (41% nonresponse), household income level (21% nonresponse), and data on recall of usage.

- Information on professional exterminator services was surprisingly sparse.

• ANALYSIS:

- Standard analysis procedures were generally used. However, some analyses required use of EPA data tapes including: (1) the Product Label File, and (2) the Inverted Chemical-Registration Number File, which proved extremely useful..

- Software was developed to integrate these files into the analysis.

- Only the most basic analysis was undertaken for this study.

• FINDINGS:

- The Sample Design: A qualitative review of available information is reassuring, producing no indication of problems. Detailed analyses of sample design will be performed under Task 20.

- Fieldwork: An extensive training guide enhanced the training program by insuring standard training across sessions/trainers. Problems with training program/ materials were identified and rectified.

- Ability to collect desired data: Contrary to expectation, respondents were reluctant to take interviewers to storage sites which raises the possibility of under-reporting. Respondents felt (probably optimistically) that six months was the maximum recall period.

- Data analysis: Demographic characteristics are easy to collect, with the exception of income. Questions relating to frequency of use, safety precautions taken, and equipment used were no problem. Quantity data is not collectible using current methodology.

• RECOMMENDATIONS:

- Questionnaire: Several question wording and reformatting changes are suggested. A major change is suggested in inventory methodology, and consideration of use of tags to identify containers inventoried by round (particularly aerosols) and use of some form of weighing machine are suggested for obtaining quantity data.

- Training and Fieldwork: Sessions should be longer. More specialized and consistent pesticide training needed. Field supervisors should be trained consistently and at one session. The number of allowed callbacks should be increased, possibly to eight.

- Sample Design: The sample design is being developed under Task 20.

- Data Analysis: The size of the data file suggests substantial efficiency can be achieved by appropriately dividing them (subsetting) into more manageable lengths. Tables seem to contain too many categories and should be reduced in dimension. Consideration should be given in planning for additional analysis, e.g., comparisons between domains, regressions, and so on. Reviewers should be encouraged to indicate their analytic requirements.

PROJECT OVERVIEW

1. BACKGROUND

1.1 Purpose of the National Household Pesticide Usage Survey(NHPUS)

*TO PROVIDE STATISTICALLY VALID QUANTITATIVE PESTICIDE USAGE DATA

*TO DEVELOP DEMOGRAPHIC INFORMATION ON USER HOUSEHOLDS

*TO COLLECT SPECIFIC PESTICIDE BY TARGET PEST BY SITE BY QUANTITY BY FREQUENCY OF USE DATA

*TO FIND USER INFORMATION SOURCES, SAFETY PRECAUTIONS, METHODS OF USE AND DISPOSAL

The overall objectives of this survey is to provide statistically valid quantitative pesticide usage data for households in the United States, state-by-state. This is the first of several nation-wide surveys to be funded by EPA to provide current quantitative pesticide usage data on urban/non-farm use sites. This is part of a general initiative by EPA to provide current quantitative usage data on all such sites over a three year period on a recurring basis. We plan to repeat these surveys approximately every three years in order to maintain relatively current data on the usage of pesticides on urban/non-farm sites in the United States. This initiative is designed to complement an initiative by USDA and the state agricultural universities which generate pesticide usage data on farm/rural pesticide use sites.

The Household Pesticide Usage Survey," as well as other surveys undertaken under this general initiative, is to provide pesticide usage data in the public domain for all users of such information, including government agencies at the Federal, State and local levels as well as the private sector. Presently quantitative usage data are very limited, out-of-date and not reliable for meeting the needs of most users of such information.

Within EPA, quantitative usage data is needed as a basis for human exposure and risk analyses, for environmental exposure and risk analyses, for analyses of the benefits to pesticide users as an input to risk/ benefit decisionmaking, for program planning and prioritization, for general monitoring activities, for integrated pest management education and training programs, for basic research, and for planning of enforcement activities. Many governmental units at the Federal, State and local levels from time-to-time have data needs in one or more of these areas. Private industry and the general public also need such data to participate in or react to various regulatory educational and related activities by government agencies and universities.

The major areas upon which data are to be obtained in the Household Usage Survey are demographic information on the household, the

specific pesticide/site/target pest/quantity/frequency data on the pesticides actually used, user information sources, safety precautions, application technology, container disposal, and unused chemical disposal. Information is needed on each of these areas by one or more of the data user groups.1/

1.2 Purpose of the Pilot Study of the NHPUS

*TO EVALUATE THE SURVEY INSTRUMENT

*TO EVALUATE INTERVIEWER TRAINING AND FIELD MANUAL

*TO DETERMINE RESPONSE RATE

*TO DEVELOP INFORMATION ON COSTS AND LENGTH OF INTERVIEW

*TO PROVIDE INFORMATION NEEDED FOR DESIGNING THE NHPUS.

The quality of the data collected from the field in the National Survey depends largely on the quality of the instrument and the effectiveness of the procedures used to administer it. In addition to operationally testing the instrument to be used in the National Survey, an examination of the feasibility of the entire system of data collection procedures should be made. A pretest of the data collection methods and procedures as proposed in the Pilot Study is the only way the problems of unreliability or invalidity of measurement can be surfaced prior to the collection of data upon which the National Study conclusions will be drawn. Additionally, the Pilot Study will provide information needed to identify any deficiencies in the interviewer training program which could affect the quality of the data being collected.

1.2.2 Objectives

The objectives of the Pilot Study are to evaluate interviewer training and to pretest methods and data collection procedures in preparation for the proposed National Survey. Specific objectives of the Pilot Study are:

(a) To evaluate the survey instrument. The effectiveness of the instrument is dependent upon the content and the wording of the questions. The Pilot Study will provide information needed to refine the instrument so that it will be as effective as possible when it is administered in the National Survey.

(b) To evaluate the interviewer training program and the field manual. Since some of the interviewers to be used in the National Survey may have little or no interviewing experience, it is essential to have both an effective training program and an effective field manual. The identification of problems encountered during data collection in the pilot study will be invaluable in providing information that can be used to improve the training program and the field manual.

1/Memorandum dated March 27, 1980 from the Chief, Economic Analysis Branch, BFSD, OPTS (TS-768).

(c) To gain information on response rates. The refusal and non-contact rates in the Pilot Study will be useful for determining the need for evening, weekend and call-back interviewing. Nonresponses in a survey will necessarily cause some bias in the survey estimates. The level of the bias is dependent upon the number of nonrespondents and the similarities between the pesticide use practices of the respondents and the nonrespondents. Obviously, if nonrespondents have different pesticide use practices than those who respond, estimates computed from the collected data will be biased. Because there is no way to determine the similarities between the two groups, the most effective way to minimize the bias is to obtain high response rates. Obtaining high response rates generally involves estensive interviewing. The Pilot Study response rates will be essential for determining the extent to which follow-up procedures are needed.

(d) To provide information on time and costs associated with the collection and processing of data. The administration times of the interviews in the Pilot Study will be used to compute an estimate of the average time required to conduct a single interview. Also, total interviewer time including travel time between interviews can be evaluated. These time estimates will aid in the establishment of a time frame for the National Survey. Additionally, the Pilot Study will provide data on the costs associated with data collection, data processing, and data analysis.

(e) To provide estimates of the variability associated with each stage of sampling. These variance estimates can be used to evaluate the effectiveness of the sample design and to provide estimates of sample sizes at each stage of sampling for the National Survey.2/

2. DATA COLLECTION AND ANALYSIS

2.1 Data Collection Activities

2.1.1 Description of the sample design

Survey samples employ lists called sample frames. These are the means of identifying the members of the population of interest, the target population. The sample is selected by drawing at random from the list. Conceptually, complete and current lists provide the basis for scientific sampling. It is the selection of sample members according to chance which provides the probability basis for general statements about the population from the sample data (called statistical inference). Unfortunately, lists of all the people living in localities of the United States do not exist. Consequently, we divide the land area into small segments and select some of them at random. This is called area sampling.

2/National Household Pesticide Usage Survey OMB Submission Package. May 20, 1980. SRDC, Research Triangle Institute, Research Triangle Park, NC 27709.

It is generally more convenient not to select these segments directly, but to first select a larger area, perhaps a State, then a county, a part of a county (called a County Census Division), and so on. Each of the successively chosen areas is called a stage. Any sample with more than one such level is called a multi-stage sample.

The larger units selected at the first stage units, often the county, are designated as of greater significance, and are called the primary sampling unit (PSU). Smaller areas within the PSU may be designated the secondary sampling unit (SSU), and so forth. These sampling units possess two important characteristics, (i) they exhaust the land area of the stage in which they lie (e.g., the totality of county lands exhaust all the land in the State where they lie), and (ii) they do not overlap.

Another important distinction is made: If several counties are selected from a State, they are called a stage of sampling, i.e., we have sampled from among the counties. If all the counties are selected from a State, the counties are called strata. One has stratified the sample within the State by taking from every county. This can occur at any level, or several levels. If we stratify by State, we must sample from every State. If we take only some States, then States are a stage of sampling. In practice, the construction of strata may become rather complex, however the distinction made here does not fail.

The Pilot Study employed a two-stage area sample. The first stage was stratified by size of locality and topography, i.e., each State was partitioned into regions hopefully, homogeneous in pesticide use. Larger, medium and small localities were grouped (stratified) within each topograhic region. The first stage units (the primary sampling units) are the Minor Civil Divisions (MCD's) or County Census Divisions in this study. The second stage of sampling consisted of units called block groups (which are groups of city blocks) or enumeration districts (small areas in localities not organized into city blocks). The selected households were taken from the block groups or enumeration districts which fell in the sample.

2.1.2 Fieldwork

Data collection took place between October 1 and 31, 1980 in three States--California, Michigan, and Louisiana. Eighteen (18) field interviewers were used during data collection, supervised by four RTI field supervisors. Four training sessions, conducted jointly by the field supervisors and two survey specialists, were held during the latter part of September. These sessions lasted three days and covered all areas necessary for proper completion of the survey questionnaires and other field forms. Representatives from EPA were in attendance at all sessions.

Lead letters were mailed to sample households before data collection began. These letters informed the residents of the nature of the survey, the need for their cooperation, and told them that an interviewer would be calling at their homes in order to conduct the interview. Most interviewers reported that when the respondent had read the letter

before the visit, his/her attitude toward participating in the study was very positive. A similar letter was also sent to various public officials in the sample areas. In addition, news releases were distributed to local radio stations and newspapers providing coverage for the areas.

More field problems were encountered in Louisiana than in the other Pilot Study States. Unforeseen problems with the training materials were detected during the Louisiana training, which fortunately was the first session scheduled. Resolution of these problems was made before the remaining sessions were begun. There were interviewer-related problems in Louisiana, also. Several persons never worked after being trained, therefore, other interviewers had to work larger case loads than anticipated, which to some extent, increased field costs. Sample dispersion and travel conditions in Louisiana posed a problem for callbacks on nonrespondents as well as increased travel costs considerably. The primary problem encountered in California was language barrier, especially in the southern part of the State where 7% of the sample households were non-English speaking. Weather and apple harvest season posed the most problems in Michigan. A freak snow storm hindered data collection for a short period and many potential respondents were too busy with apple harvest to participate.

It should be noted similar field problems are not uncommon for household surveys and a relatively successful response rate of 80.5% was achieved. This rate is quite good considering that only four callbacks were allowed for nonrespondents. It also is a positive reflection on the quality of training, efficiency and experience of the field staff, and proper project planning. Response rates by State were: California -- 82.4%, Michigan -- 82.9%, and Louisiana -- 76.2%. The average cost per interview was $23.12; 524 questionnaires were completed from 727 sample housing units.

2.1.3 Survey Questionnaire Discussion

Initially, plans for questionnaire development called for the design of between two and four instruments to be tested in the Pilot Study. Each questionnaire alternative was to embody a different methodological design and each design option was to test various recall periods.

The major areas of data which all instruments were designed to collect were: demographic information on the household, specific pesticide/site/ target pest/quantity/frequency data on pesticides used during the recall period, user information sources, safety precautions, application technology, container disposal, unused chemical disposal, and target pest/site/frequency/ cost data on pesticides applied by commerical pest control operators. For purposes of this study, the term "pesticide" included all categories of pesticides except plant growth regulators, antitranspirants, and disinfectants without EPA registration numbers.

A series of three pretests were conducted using the various questionnaire designs until a final questionnaire was developed and submitted to OMB for review/approval. The primary data collection instrument used during the Pilot Study was known as the Core Questionnaire and contained five sections:

- the Household Section -- collected basic demographic data on household members, and obtained information on the kinds of buildings/outdoor areas maintained on the premises, primary household ethnicity, and classification of type of residence. An introduction to the inventory process closed this section.

- the Usage Inventory Section -- contained 17 questions concerning all pesticides used during the recall period, which for the Pilot Study was June 1 - September 30, 1980. Only pesticides for which containers were still on the premises were listed in this section. A complicated and extremely detailed question/ matrix concerning indoor/outdoor usage, number of applications, and site/pest appeared in this section.

- the Usage Inventory Section (Pesticides Not on Premises) -- this section was almost identical to the preceding section with the exception of several questions concerning disposal methods for pesticides/containers.

- the Professional Exterminator Section -- collected information on the use of professional exterminators for pest control, either under contract or by other means.

- the Recall and Income Section -- the final section asked the respondent how long he/she would be able to reasonably recall usage information. In addition, household income data and telephone number were obtained and information on respondent attitudes was requested from the interviewer.

Two secondary data collection instruments were used: (1) the Continuation Section, which was basically a subset of the Core Questionnaire (used to record data on more than nine pesticides used during the recall period), and (2) the Nonusage Inventory Form, which was used to record basic data on pesticides found on the premises but not used during the recall period.

Specific recommendations for changes to the survey instruments are discussed in Section 3.4 of this overview. A general evaluation of the instruments follows.

2.1.4 Questionnaire Evaluation

Generally speaking, the Core Questionnaire was effective in gathering the required data. Several problem areas have been identified and plans for correcting these problems will be incorporated in the revisions in preparation for the National Survey. Each section of the questionnaire will be covered.

(a) Household Section: Basically, there were no major problems encountered in this section.

(b) Usage Inventory Section: Many of the questions relating to pesticide storage and reading of instructions elicited positive data. However, some problem areas are obvious, such as the

quantity questions. Forty-one percent of the completed questionnaires had missing values for these questions. This largely reflects the frequency of use for aerosols since these questions were skipped for such products. Also, there is a problem with reporting by standard units of weight.

Generally, most of the other questions in this section elicited useful data and caused few field problems or problems in analyses. Using the Pilot data, it will be possible to eliminate some response options, add others, and streamline and/or reword some questions in order to better define the objectives.

(c) Usage Inventory Section (Pesticide Not on the Premises): This section proved to be of little use during the Pilot Study. Almost 63% of the respondents reported no pesticides used, and 28% reported only one used. For those reporting usage information, the quality of the data is questionable because complete names were not given, registration numbers cannot be obtained, and other information appears to be quite sketchy.

(d) Professional Exterminator Section: The section presented no major field problems. The reported data are of some interest, however. Eighty-two percent of the respondents reported having no professional exterminator contract and 94% said that no services were used during the recall period.

(e) Recall and Income Section: The most problematic question in this section was the income question. Twenty-one percent of the respondents either refused to answer the question or reported "Don't Know." The positioning of the question may have created the problem; however, questions of a similarly sensitive nature frequently have lower response rates. Ninety percent of the respondents provided a telephone number upon request.

The inventory methodology has been an area of concern for some time. There is some reason to believe that under-reporting may result because of two principal factors: (1) respondents quickly learn that the more pesticides identified, the longer the interview, and (2) the response cards fail to educate respondents adequately. Possible solutions to the under-reporting may be the use of a screening questionnaire, better response cards, and illustrations of common pesticide containers. Other recommendations resulting from the Pilot Study include reducing the size of the document, including the Nonusage Inventory Form as part of the Core Questionnaire, eliminate the Continuation Section and simply use additional questionnaires as needed, and improve instruments within documents.

2.2 Data Analysis

2.2.1 EPA data files

Certain features of the analysis plan require information that is collected and maintained by EPA. Copies of two EPA tapes were obtained by RTI:

(1) The Product Lable File, which relates each pesticide (identified by a unique EPA Registration Number) with a formulation code, a list of active ingredients, and a list of pesticide classification codes.

(2) The Inverted Chemical-Registration Number File, which relates each active ingredient to its chemical (not commercial) name, and a list of pesticides (identified by their EPA Reg. Nos.) containing the active ingredient.

For the purpose of future surveys, like the National Study, it would be useful to obtain copies of two additional tapes:

(3) A file relating EPA Registration numbers to commercial names of pesticides, and

(4) A file relating State Registration Numbers to EPA numbers.

2.2.2 Demographic Characteristics

The reciprocal of the selection probability of any given unit in the sample is commonly called the sampling weight of the element. The weight can be regarded as an inflation or expansion factor by which the aggregate of the sample observations estimate the entire target population. Sampling weights were calculated, and adjusted for nonresponse, for all the observations in the sample. Since each weight represents the number of households in the State represented by a given observation in the sample, all the responses from a questionnaire were multiplied by the appropriate weight in order to obtain estimates for the State. All reported results are based on these "weighted" responses.

The first part of the analysis consists of a set of tables providing statistics describing the population sampled in each State. The results can be compared with the Census data for the States to evaluate the weighted sample with respect to certain demographic characteristics.

To complement the control data, similar tables were generated based on the data from the 1970 U.S. Census. Note, however, that the 1980 Census data when published will be more appropriate for comparison than the 1970 Census data.

A common pitfall for such comparisons is that some will take them as proof or disproof of whether or not a sample is "valid" or "representative." The matching or mismatching with control data on selected factors should not be interpreted as proof one way or the other as to how "good" the sample is for estimating the factors under study.

The demographic tables and the Census data can be found in the Appendix, (Tables 1-4) and a discussion of the results can be found in the Technical Report (Section 3.3).

2.2.3 Analysis of type of pesticide

The EPA Pesticide Product File classifies each product according to its potential use. Products are not uniquely assigned to one category--60% of them are classified in more than one way. For this purpose, EPA uses 40 different categories. For the purpose of the present analysis these categories were combined into four general classes: insecticides, herbicides, fungicides and others. Additional types of pesticides were eliminated from the analysis because few, if any, products in this category were reported.

The use of different types of pesticides was analyzed with respect to different characteristics of the household (type of residence, income of family, frequency of pesticide use), the way the pesticides are stored, the source which recommended purchase of the pesticide and the site of application and type of pest controlled.

The results of this analysis are presented in tables 5-10 in the Appendix, and a discussion of the estimates obtained can be found in Section 3.6 of the Technical Report.

2.2.4 Analysis by active ingredient

The EPA Product File links each pesticide with a list of its active ingredients. The number of active ingredients listed for the different products varies from one to 18. For the pesticides reported in the present study, a total of 161 different active ingredients were identified. Of those, 107 were reported in California, 84 in Louisiana and 112 in Michigan. The majority of these ingredients was found in a small fraction of the pesticides listed in the State. Display 1 presents a list of the ten most prevalent active ingredients. For the purpose of the Pilot Study only these ten ingredients were analyzed.

Display 1. Active Ingredients Selected for Analysis

Active ingredient	EPA number
Ethanol	1501
d-trans-Allethrin	4003
o-Isopropoxyphenyl methylcarbamate	47802
Carbaryl	56801
N-Octyl bicycloheptene dicarboximide	57001
Petrolum distilate, oils, solvent, or hydrocarbons	63503
Piperonyl butoxide	67501
Pyrethrins	69001
2,2-Dichlorovinyl dimethyl phosphate	84001
Resmethrin	97801

The use of each of the ten active ingredients was analyzed with respect to some of the household characteristics (type of residence, family income, household size), and some of the principal user characteristics (sex, age). Also, the frequency of use of any given active ingredient was analyzed by its storage site, source of recommendation, formulation, equipment used in application, safety precautions taken at use, reading and understanding of the instructions on the lable, and purpose of use (preventive measure or existing problem).

The results of the analysis can be found in tables A, D, and E in the Appendix and a discussion of their interpretation is included in Section 3.7 of the Technical Report.

2.2.5 Quantity data analysis

The EPA file lists the percentage of weight each active ingredient constitutes of the pesticide. Estimates of the quantity of a given active ingredient used were obtained from the total quantity used in a given household (as well as the total quantity used indoors and outdoors) multiplied by this fraction.

Several serious problems were encountered in this stage of the analysis. First, a considerable number of households did not report valid quantities. Several factors could have caused this fact--uncertainty regarding the date of use, inability to estimate quantity used, or report of quantity in nonstandard units (e.g., squirts). Second, the units of measurements varied from one pesticide to another--some were reported as weights (ounces, pounds), and others as volumes (fluid ounces, pints, quarts, tablespoons, cups). Display 2 represents the number of pesticides for which valid usage quantities were reported. Considering the fact that these values are aggregated across the three States, it appeared that for only one of the

Display 2. Number of Respondents Reporting Valid Quantities

Active Ingredient	All reports	"Good" quantities	"Dry" only	"Fluid" only
1501	82	21	9	12
4003	78	5	4	1
47802	169	11	10	1
56801	92	78	61	17
57001	70	13	10	3
63503	324	46	25	21
67501	122	22	16	6
69001	95	24	17	7
84001	116	7	4	3
97801	84	0	0	0
Totals:	1232	227	156	71

ten active ingredients (56801) was the number of pesticides reported large enough to justify an estimate at the State level.

In estimating quantity used, several assumptions were made:

(1) For all fluid quantities, it was assumed that all the pesticides have the same density (volume/weight ratio) and that this density is one. It is however recognized that pesticides vary in their densities.

(2) It was assumed that whenever quantities used were reported in non-technical units (e.g., tablespoons, cups, etc.), these values can be converted to ounces of fluid ounces according to the regular conventions. However, we realize that "a tablespoon of pesticide x" may not always correspond to 0.5 fluid ounces of the substance.

(3) It was assumed that all quantities reported reflected use of the pesticide itself. It should be mentioned, however, that many pesticides are diluted or dissolved in water, or other liquids prior to use, and that the ratio of dilution is likely to vary from one product to another and from one user to another.

Tables B and C in the Appendix present the average quantity of Carbaryl (56801) used, as reported in ounces and fluid ounces respectively.

3. FINDINGS

3.1 Effectiveness of the Sample Design

This analysis will be undertaken in Task 20, however since the multi-stage area sample involving stratification is a standard design employed many times before, its characteristics are well known. Consequently, no problems or great inefficiencies are expected. As information on various costs and the variability occurring at each stage of sampling is developed, greater effectiveness can be achieved.

A qualitative review of the data suggests that stratification to obtain homogeneous pesticide-use regions is effective in reducing variability. Stratification by size of locality also is important in both increasing precision and improving coverage.

3.2 Fieldwork

3.2.1 Effectiveness of Training

Generally, the training program proved effective. With a few exceptions, the topics were covered in training in the same order as they were performed in the field. One goal of the training was to provide consistency in all sessions. To achieve this, an extensive training guide was developed for use by the trainers. This guide provided a script that could generally be read verbatim. This method proved most helpful and was highly praised by the field staff during the sessions and at the debriefing after data collection.

In addition to the guide, several audio-visual aids were used. These included a video presentation on general interviewing techniques, overhead transparancies, and displays (using chalk-boards, tablets, etc.). Despite the emphasis placed on consistency, two areas of training were not consistent from session to session, because a detailed script was not developed. The first area was the Field Supervisor (FS) training which was guided only by a prepared agenda. The major topics covered during the FS training session were a review of the Field Supervisor (FI) training agenda, a thorough review of the sections assigned to the FS for FI training, a brief review of the other sections of the FI manual, and a thorough review of the FS Supplement to the manual. The second area of inconsistency was the Pest and Pesticide section of the FI training. Because three different pesticide experts were used for this portion of the training and because each used his own approach to the same general subject matter, different areas were emphasized and, in some cases, different material was introduced.

Because the National Survey is likely to require more than four training sessions with more than two principal trainers, consistency will be of paramount importance. Consequently, planning for the National Survey should include changes in the training that will ensure consistency in the FS and Pest and Pesticide training areas.

The only other major changes required for the National Survey (in addition to streamlining many topics) are: 1) Increase the length of the FI training session to four or five days in order to spend more time on mock interviews, overcoming objections at the door, re-showing the video on general interviewing techniques and showing a video on probing techniques; 2) Re-schedule the edit exercise so its value can be transferred to the interview situation; and 3) Develop exercises using actual pesticide containers to teach accurate recording of label and quantity information.

3.2.2 Ability to Obtain Desired Data

The consensus during questionnaire development was that respondents would allow the interviewers to go about the premises to identify pesticides. It was on this supposition that the inventory methodology was developed. However, the Pilot Study statistics clearly show the respondent's preference for bringing the pesticides to the interviewer. The methodology did not work as anticipated and this raises the possibility of under-reporting, as stated earlier. To get some measure of under-reporting, interviewers were instructed to probe at the end of the interview in order to possibly identify any missed pesticides. Of the questionnaires reviewed, 68% reported no missed pesticides, 19% reported one missed, 11% reported two missed, and 1% reported three or more missed. Therefore, while under-reporting is still a problem, an improved questionnaire methodology should be implemented to include probing.

Eighty-five percent of the respondents felt that they could recall information for six months, but the percent dropped significantly for longer periods, leading one to theorize that a six month recall period may be the maximum usable without jeopardizing the quality of data.

The average number of pesticides used was four, thus lessening concern that during periods of high use (i.e., late spring through early fall), reporting may be more difficult. However, the data reflect problems for any recall period in reporting quantity of use. As previously stated, 41% of the questionnaires had missing values for these questions. Clearly, this subject should be carefully reviewed and additional methodologies developed and tested for collecting such information.

3.2.3 Factors Affecting Response Rate

The primary factors affecting the response rate are:

(a) The inventory methodology. Respondents seem to learn quickly that the more pesticides they identify, the longer the interview.

(b) The number of callbacks. All field staff reported that the response rate could be increased if more callbacks are allowed. Eight is the number suggested.

(c) Language barriers. Non-English speaking people reduced the response rate, particularly in Louisiana and Southern California.

(d) Lead letters arriving too far in advance of FI visit. When letters arrive too far in advance, their effectiveness is diminished. It might be better for FIs to mail the letters directly to the housing units closer to the scheduled field visit.

(e) Factors beyond normal control. These include weather problems, field staff illness, etc.

3.3 Data Analysis

3.3.1. Aspects of the analysis that were performed successfully

(1) A prerequisite for most of the analysis was the identification of the reported pesticides on the EPA files. Of the 1286 pesticides reported on the premises 215 (16.7%) had non-EPA numbers, and 49 (3.8%) had EPA numbers which were not found on the EPA tape. These pesticides were not included in the analyses performed. Hard copy lists of these products were generated. The vast majority of pesticides listed (1022 = 79.5%) had valid registration numbers which were matched with EPA files. This high proportion of "matches" demonstrates the high quality of the data collection effort, and the feasibility of the proposed method of analysis.

(2) Generally speaking, it was demonstrated that all the tables involving the demographic variables, and the analysis by type of pesticides, can be performed successfully without major difficulties. From the perspective of the present project,

these aspects of the analysis can be considered satisfactory. For the purpose of the national study, or other State or regional efforts, some minor modifications (to be described in the next section) may prove to be useful in the sense that they are likely to make the results more meaningful and easier to interpret.

(3) Tables A, D, E, demonstrate the capability to obtain valid and meaningful estimates of the frequency of use of various active ingredients, and to cross-tabulate these estimates by the safety precautions and equipment used during application and by the characteristics of the user and the household. We are particularly pleased with the fact that frequency-of-use data were obtained for most pesticides reported, and by the fact that aggregate estimates for active ingredients (for a variety of pesticides) were obtained.

(4) Although this was not one of the purposes of the Pilot, we have attempted to identify the most frequently used pesticides. A list of the 18 most popular pesticides can be found in Display 3. Note that 10 pesticides account for 28.5% of the total reported, and the first 18 account for 37.8% of the total.

3.3.2 Aspects of the analysis which require slight modifications in the methodology

(1) A relatively good correspondence was obtained between the demographic data and the Census information for the States. The accuracy of these comparisons can be further improved by using data from the recently completed 1980 Census, and by changing the reporting categories of these variables to better match the categories used by the Census Bureau.

(2) A problem in all the tables of the analysis by type of pesticide is the large number of cells with zero or missing entries. This fact indicates that there is a tradeoff between the sample size and the level of detail that can be achieved in the analysis. The number of categories used in these tables should be reduced. This should improve the quality of all the tables, and in particular of tables 2 and 8 which contain the analysis of pest controlled by site of application by type of pesticides - pests should be collapsed into 5 to 7 categories and sites of applications should be combined to yield four to five categories.

(3) The active ingredient analysis suffers from a similar problem. First the number of active ingredients used in the analysis should be reduced to two or four. The choice should be based on the frequency of report in the present study, and chemical considerations, and should be made in close cooperation with EPA. Second, the number of categories used for the reporting variables should be reduced. As a rule of thumb the number of categories for each variable should be kept under seven.

Display 3. The Most Frequently Reported Pesticides

Rank	Reg. No.	Name	Frequency of report
1	4822-111	Raid Ant & Bug Spray	5.28%
2	777-53	Lysol Spray	4.99%
3	4822-10	Off	3.43%
4	475-136	Black Flag Ant & Roach Spray	2.86%
5	1730-36	Pine Sol	2.45%
6	432-536	Raid House & Garden Spray Formula III	2.35%
7	4822-84	Raid Professional Strength	2.06%
8	5813-1	Clorox	1.96%
9	3573-2	Comet Chlorinol	1.76%
10	4822-38	Raid House & Garden Spray	1.47%
11	239-565	Ortho Tomato & Vegetable Dust	1.27%
12	239-2346	Ortho Rose & Floral Dust	1.17%
13	777-10	Lysol Regular	1.17%
14	777-25	Lysol De-odorizing Cleaner	1.17%
15	4822-136	Raid House & Garden Spray Formula II	1.17%
16	239-739	Ortho Malathion 50 Insect Spray	1.08%
17	475-156	Black Flag Insect Spray	1.08%
18	777-29	Lysol Toilet Bowl Cleaner	1.08%

3.3.3 Aspects of the analysis which require major changes in methodology.

(1) EPA plans to conduct a national survey of use of pesticide control operators. Although the focus of the present study was to investigate nonprofessional use of pesticides some information was collected about services provided by professional operators. For each State, estimates of the number of households which have a contact with such operators were attempted, and the average cost per contract found. The majority of households (80% in CA, 77% in LA, and 89% in MI) did not report contracts and many of those who have could not remember, or did not report, their costs. Given the small sample sizes and the small proportion of household reporting costs it seems that valid estimates of these parameters must be obtained by other means. In addition, we have tried to estimate the number of households using professional services on a non-contract basis by the pest controlled and the site of application. Only 51 questionnaires reported the type of pest controlled. Of those about two thirds were roaches, and no other pest was reported by more than 4 households. The large majority of households interviewed (91% in CA, 92% in LA, and 99% in MI) did not use any professional services. Since the estimated number of households using different types of services (i.e., different combinations of site of application and pest controlled), and the estimated costs are based on a very small number of observation, it is recommended that this information be obtained by other means.

(2) Most tables were based on the pesticides on premises that have been used between June and September 1980. However, data were collected about the number of households storing pesticides on the premises but not using them, and the number of households reporting having used pesticides and discarding the container prior to the date of the interview. Only 258 reports of pesticides not on the premises were recorded. Since in these instances EPA Reg. Nos. are not available, and information about the type of the pesticide, active ingredients, etc., cannot be obtained, these observations are of little relevance. Also, we suspect that a recall problem exists in these cases. It is recommended discontinuing this part of the questionnaire, unless the National Study includes periodic visits to the sample households. This option promises more accurate follow up on the use of pesticides.

(3) Overall, 556 reports of pesticides were listed in the three States as being on the premises, but not being used. One hundred and sixty-seven of them (30.0%) did not have EPA registration numbers, (either non-EPA numbers or no number reported), and 326 of the reported pesticides (58.6%) were identified in the EPA files. At the present time, these pesticides have not been used in the analysis in any significant way. This situation is likely to change only if the National Study includes repeated visits to the same households at fixed intervals. However, if this option is not be included in the design, we see no major use for these data and recommend dropping this part of the instrument.

(4) As shown in Display 2, RTI has encountered serious problems in obtaining data for quantity estimation. When valid responses were obtained the estimation procedure required many assumptions. It is our conclusion that the methodology used will fail to generate valid estimates of quantities used and it should be replaced by an alternative one. One possibility is tagging and weighing opaque containers, particularly aerosols, on a periodic basis.

3.4 Recommendations

3.4.1 Survey Instrument

The following changes are suggested for the Core Questionnaire.

Item Number	Recommended Change
4	Add reference dates. Explain "maintain."
5	Put at end of questionnaire.
6	Put at end of questionnaire. Change categories from "Row house/garden apartment" to "House or apartment with direct ground level access" and "Apartment house (high rise building or housing unit without direct

	ground level access)" to "Apartment or house without direct ground level access."
7a	Allow standard abbreviations.
8	Needs to be added to Nonusage Inventory Form.
9	Write registration number on same line as EPA, USDA, or State.
10	Since no computer file exists which links brand name to formulation, may be deleted.
11	Put in question form.
12	Change wording to "How did you learn about this product?"
13	Preface question with "As you know, labels are sometimes hard to read."
14	Change wording to "Were the instructions clear?" Add DK to response choices.
15	Add "Pets" to indoor and outdoor site codes; add "Germs" to indoor pest list; allow multiple site codes; possibly delete question on number of times the product was applied; let interviewers code pests rather than having them precoded down the page; repeat question on p.9.
16a	Change wording to "Who used or applied this product most often? Was it a male or female? How old is (he/she)?" Allow multiple responses if applied equally by more than one person.
16b	Change wording to "Did you use anything other than the original container to apply this pesticide?" If yes, "What?"
16c	Change wording to "Were any safety precautions used when this product was applied?" If yes, "what were they?"
17	Revise with three waves of data collection in mind.
18	Delete this section. Possibly replace with one general question.
26	Ask separate questions for respondent contracts, landlord contracts, and community services such as rodent control; differentiate between a contract and a request for service without a contract.

3.4.2 Training and Fieldwork

The following are recommendations for changes to the training and field work.

1. Conduct a centralized training session for the field supervisors.

2. Conduct five-day training sessions for inexperienced interviewers and four-day sessions for experienced interviewers.

3. Administer more home study quizzes before training session to reinforce contacting/locating the respondent, recording conventions, questionnaire specifications, and pests and pesticides. This is especially crucial for experienced interviewers missing the first day of training which covers contacting/locating, production reporting, and standard recording conventions.

4. Develop more consistent pest and pesticide training.

5. Increase time spent on reading pesticide labels.

6. Spend more time on overcoming objections at the door using mini-mock interviews.

7. Begin mock interviews at 9:00 a.m. so interviewers will feel fresh at this time.

8. First mock interview should be conducted as a demonstration using the trainers as interviewer and respondent.

9. Develop 5 or 6 other mock interviews.

10. If training sessions are large, split group into triads for mock interviews.

11. Have trainer stay an extra day in each site, if possible, to assist interviewers who seem to be having problems.

12. Train interviewers in probing techniques using the video tape developed by Mathematica and mini-mock exercises.

13. Simplify and streamline training on production reporting.

14. Schedule the in-house edit exercise at a more appropriate time then at the end of the training session. It might be good to do a second mock interview between the trainers having the Field Interviewers coding the responses. They could then edit those questionnaires.

15. Conduct a separate training session for Rounds 2, 3, and 4 of data collection. The session should be scheduled just before the start of Round 2.

16. Allow more than four callbacks.

3.4.3 Sample Design Recommendations

Complete recommendations regarding the sample design for the NHPUS are being developed in Task 20, which is a continuation of this project. Those activities are described both in the Task 20 Workplan and in evaluation of the alternatives specified in the letter from John Smith to Frank Potter dated January 1, 1981. However, some observations based on the analysis of the Pilot Study date can be made.

*THe stratification used achieved gains in precision

Stratifying the sample on size of locality which provides some control on population density reduced variability by 40 or 50 percent in some cases. It is also likely that topographic stratification to isolate regions relatively homogeneous in pesticide requirements produced additional gains in precision, however, these data are not yet analyzed.

*The effect of sample size on the ability to construct complex tables is clear: small samples mean zero cell numbers

Tables that have either many levels for each factor, or have many factors, as:

	Family Size										
	1	2	3	4	5	6	7	8	.	.	.
0-2999											
3000-4999											
5000-6999											
Income 7000-8999											
9000-10999											
11000-12999											

or

State x Pesticide x Site x Age of User x Sex of User x ... ,
have many cells. To fill them will require large sample sizes.

For example, (5 States) x (10 sites) x (4 age groups) x (2 sexes) x (3 frequency of use categories) x (10 target pests) = 12000 cells.

The usual rule-of-thumb is 5 observations per cell, so here we are talking about a sample of 5 x 12000 = 60,000 households. The lesson is: Small samples provide for small tables, large or complex tables require large samples.

3.4.4 Data Anaysis

(1) In order to increase the precision and the validity of the estimates, a serious effort should be made to obtain from EPA, or other sources, files linking State Registration Numbers to EPA numbers and, thus, to active ingredients and type codes.

(2) In order to (a) increase the efficiency of the analysis and (b) reduce its cost, the number of categories of the variables of interest should be reduced and, if possible, be kept under seven.

(3) A small number of active ingredients, pesticides and types of pesticides of interest should be identified prior to the analysis.

(4) The experience of the Pilot Study has shown that it is not practical nor efficient to work with the large raw data file. Instead, the data set should be subsetted into smaller files which correspond, in terms of the information they contain, to the different facets of the analysis. It is recommended that prior to the analysis the content of these data sets be decided, and software capabilities for merging and/or combining the different files be developed.

(5) Further recommendations will be generated based upon the first part of Task 20.