A RAND NOTE

1979 RESERVE FORCE STUDIES SURVEYS:
WEIGHTING THE SURVEY DATA

David W. Grissmer, Sheila Nataraj Kirby
with the assistance of Corazon Francisco

February 1984

N-2080-RA

Prepared for

The Office of the Deputy Assistant Secretary
of Defense, Reserve Affairs

Rand
SANTA MONICA, CA. 90406

The research described in this report was sponsored by the Office of the Deputy Assistant Secretary of Defense, Reserve Affairs, under Contract No. MDA903-83-C-0047.

Published by The Rand Corporation

A RAND NOTE

1979 RESERVE FORCE STUDIES SURVEYS:
WEIGHTING THE SURVEY DATA

David W. Grissmer, Sheila Nataraj Kirby
with the assistance of Corazon Francisco

February 1984

N-2080-RA

Prepared for

The Office of the Deputy Assistant Secretary
of Defense, Reserve Affairs

Rand
SANTA MONICA, CA. 90406

PREFACE

This Note was prepared as part of the Rand Defense Manpower Research Center, sponsored by the Office of the Assistant Secretary of Defense (Manpower, Installations and Logistics)--OASD (MIL). With manpower issues assuming an ever greater importance in defense planning and budgeting, the Rand study program seeks to develop broad strategies and specific solutions for dealing with present and future defense manpower problems.

The 1979 Reserve Force Studies Surveys were designed and conducted under the Rand program to provide the Office of the Deputy Assistant Secretary of Defense (Reserve Affairs)--ODASD (RA)--and the Army reserve components with data to support policy formulation and research on reserve force manning, readiness, and unit locations. The survey was administered to the enlisted personnel and unit commanders in a sample of 441 Army National Guard and Army Reserve units.

Three earlier Rand Notes describe the 1979 surveys in detail:

- Zahava D. Doering, David W. Grissmer, Jennifer A. Hawes, *1979 Reserve Force Studies Surveys: Survey Design, Sample Design and Administrative Procedures,* N-1749-MRAL, August 1981.
- Zahava D. Doering, David W. Grissmer, Jennifer A. Hawes, *1979 Reserve Force Studies Surveys: User's Manual and Codebooks,* N-1755-MRAL, September 1981.
- Jennifer A. Hawes, *1979 Reserve Force Studies Surveys: Description and Evaluation of Survey Procedures,* N-1750-MRAL, September 1981.

The present Note, the last in the series documenting the 1979 surveys, details the weighting procedures used to correct for the bias stemming from nonresponse to the survey. It describes the sample selection and explains the simple weighting scheme. The weighting will allow analysts to compute more accurate population statistics from the data.

The work described in this final Note was conducted under Task Orders 82-III-I and 83-III-I, Reserve Forces Attrition and Unit Location Analysis, in Contract MDA903-80-C-0652, and under Contract MDA903-83-C-0047. It should be useful to analysts using data from the survey to study reserve force policy issues and to those involved in the design of future reserve surveys.

SUMMARY

The 1979 Reserve Force Studies Surveys were administered to enlisted personnel and unit commanders in a sample of 441 units during November 1979 and July 1980. Data were collected through four survey questionnaires: Form 1 solicited information from junior enlisted personnel (E-1 to E-4), Form 2 from senior enlisted personnel (E-5 to E-9), and Form 3 from unit commanders; Form 4, completed by a unit technician or the unit commander, sought information about the unit.

The surveys collected (1) data on factors operating within the unit and the surrounding community which could explain differences in reserve force unit manning and readiness levels; (2) descriptive statistics from a representative sample of the reserve force enlisted and unit commander population; (3) data on factors influencing enlistment and reenlistment decisions; and (4) a baseline data set for a reserve force population sample that can be monitored in the future to study reserve force attrition.

To gather data with which to characterize the Army National Guard and Army Reserve populations, we drew a random sample of units. To identify factors that distinguish units at full strength from units below strength, we chose a second, case study sample. We administered the four survey questionnaires to each sample.

The random sample consisted of 113 Army National Guard units and 109 Army Reserve units. For the National Guard, we drew a simple random sample. However, because the Army Reserve had a disproportionate number of small units (fewer than 40 reservists), we chose a stratified random sample, with unit size the stratification variable.

The case study sample was selected in steps. Units were first classified by type (function, and table of organization and equipment); only those types with a minimum of 25 units were eligible for selection. Next, we chose six types of units from among the Army Reserve and Army National Guard components such that (a) these types reflected both combat and support missions and (b) each type showed a reasonable dispersion of strength levels across individual units. Approximately 45

units of each type were chosen. Some 40,000 enlisted personnel were sampled with approximately equal numbers in the random and case study samples.

The survey response rates differed widely across the four survey forms. In both components, well over 80 percent of the Unit and Unit Commander surveys were completed, thanks in part to the more intensive follow-up of these forms. Enlisted personnel, however, returned only 44 to 67 percent of the questionnaires, depending on the survey and the component.

Since nonresponse to some survey forms was fairly high, the data contained possible bias. Therefore, we had to weight the data before we used them. This note considers weighting only with regard to the randomly sampled units and enlisted personnel.[1]

The information on these four survey forms can be used to describe the unit and population of the Army reserve component. Because we have certain unit data and demographic and military rank personnel variables across the entire reserve unit and personnel population universe, we can adopt poststratification weighting procedures to compensate for missing surveys. Poststratification is basically an adjustment or correction based on the representativeness of the survey return sample with the population universe. Weights are used in the estimation process in an effort to make the returned sample more representative of the population.

The chi-square test was used to determine the representativeness of the returned unit survey sample as measured by several variables relating to unit strength and unit size. The Army National Guard sample closely resembled the population; the Army Reserve sample, however,

---

[1]Each survey form administered under a different sampling plan (4 forms x 2 sampling plans = 8 potential weighting schemes) needed separate consideration with regard to nonresponse bias and weighting. The unit commander forms administered under the random and nonrandom sampling plan could not be weighted, since data on characteristics of the general unit commander population were not available. However, the high response rate for this group makes nonresponse bias potentially less troublesome. The two enlisted forms and unit survey administered under the case study sampling plan are not explicitly considered here. No analytical interest exists in estimating population means for the case study sample universe. Rather, data from each unit sampled may eventually have to be weighted so that units may be compared. Such weighting is beyond the scope of the present note.

differed statistically from the population because of both stratification and nonresponse. Relative to the population, the sample evidently underrepresented small units and overrepresented large units.

We used authorized unit strength as the weighting variable and computed poststratification weights for the units (grouped into unit sizes of 0 to 40, 41 to 100, 101 to 160, and over 161) as the ratio of expected to observed frequency counts in each of the form cells. Weights ranged from 2.19 for the smallest units to 0.46 for the largest. The use of these weights eliminated the statistical difference between the survey unit file and the survey population file.

Deriving weights was less straightforward for the personnel file than for the unit file. Potential weighting candidates included such demographic variables as age, race, sex, pay grade, and education. The chi-square test indicated that bias existed in response by age, race, education, and pay grade. Indeed, the distribution of the last two variables in the survey sample was exceedingly skewed in relation to the population distribution.

We learned, however, that the updating of the personnel tapes lagged with respect to these variables. Thus, the survey data represent the enlisted population more accurately than the data contained in the master personnel file. We then computed poststratification weights using only age group, sex, and race (a total of 20 cells, including five for age, two for sex, and two for race). These weights ranged from .81 to 2.50.

Weighting the data insures only the representativeness of the returned sample on the weighting variables themselves. It leaves an unknown--but presumably smaller--bias in other variables for which comparable sample and population data do not exist.

The weighted data from the random unit file can be used to describe and analyze several interesting characteristics of Army Reserve and National Guard units not previously available. These include characteristics of the surrounding community, such as size, type (inner city, suburb, etc.), presence of educational institutions, number and type of competing reserve units, and proximity to military exchanges and military training facilities. In addition, the unit file will contain data on the state and federal military benefits available to units, as

well as unit performance data, such as combined training with active units and overseas training.

The two weighted personnel surveys will provide, for the first time, a comprehensive description of Army Reservists and National Guardsmen. Data will include military history, civilian labor force experience, civilian job characteristics, family statistics, enlistment and reenlistment motivation, employer leave policy, and several attitudinal variables describing equipment training and unit problems. Beside simple descriptive statistics, the data will support the development of statistical models of reenlistment behavior from first term to career, attrition behavior during first term, and unit manning levels. In the last case, community characteristics that lead to sustained high manning levels can be analyzed.

ACKNOWLEDGMENTS

The Defense Manpower Data Center (DMDC) processed the 1979 Reserve Force Studies Surveys during the weighting process. We acknowledge particularly the assistance of Gwen O'Neil and Mia Nelson, who patiently managed this data file from initial editing to weighting. At Rand, Robert Bell thoughtfully reviewed this study and Priscilla Schlegel provided computational assistance. Barbara Eubank and Luetta Pope patiently typed and retyped the study through its various drafts.

CONTENTS

TABLES

I. INTRODUCTION

The 1979 Reserve Force Studies Surveys were undertaken to help fill critical gaps in information about reserve force personnel and units. This information deficit was substantial, partly because reserve personnel had not been surveyed systematically. Although active personnel have been surveyed periodically since the early 1970s through the Department of Defense Survey of Active Personnel, the Armed Forces Entrance and Examining Station survey, and numerous service-specific surveys, the Department of Defense neither includes reserve personnel in these surveys nor surveys them separately on a continuing basis.

This lack of reserve force surveys is unfortunate because survey data are more critical to reserve manpower policy analysis than to active force analysis. For active force personnel, an extremely rich and detailed set of historical data are collected and maintained in computerized personnel files. These data can support many kinds of analysis without the need for supplementary survey data.

Reserve personnel files not only contain fewer data than active force files, but the data that are usually collected are less valuable in analyzing reserve personnel policy decisions. The reserve data are less valuable because reserve personnel behavior depends to a great extent on the course of their civilian jobs and family life--areas in which only surveys can provide the necessary data.

At the same time, surveying reserve personnel presents certain challenges stemming from their limited availability and weaker attachment to the military job. Obtaining the adequate response rates needed for analytic credibility can be difficult.

Since moderate levels of nonresponse characterize reserve surveys, the data must be weighted. Without adjustment, obvious differences in representation of different groups in the population and survey sample may threaten credibility. Although postsurvey weighting can correct this representation for certain variables, it nevertheless leaves an unknown, but presumably smaller, bias in the remaining variables.

Weighting procedures must be documented so that users of the survey data can judge the applicability of the data to specific policy issues. We can weight our data because we chose military survey samples from personnel files containing data on the demographic and military characteristics of both the population universe and the specific survey sample. By combining these data with data from the returned surveys, we are able to weight and improve estimates from the survey data.

This note reports the magnitude of nonrepresentativeness between the returned survey population and the reserve population for several demographic status variables. Determining response rate patterns under different administration modes becomes important in designing future reserve surveys.

Survey response on personnel surveys proved lower among reservists who are young and white, but was nearly identical for males and females. This pattern was similar for both National Guard and Army Reserve personnel. One explanation for the pattern of nonresponse is the more frequent absence of younger reservists from drills, owing either to initial active duty training or early attrition.

Response rates could not be compared for groups with different education levels or military ranks, since data on the personnel files are not current. Response patterns on the unit characteristics survey showed Army National Guard units that returned surveys to be representative of all Guard units; in contrast, large Army Reserve units responded better than smaller units.

We developed simple weights for the unit survey based on unit size for the Army Reserve units. Personnel survey weights were developed separately for National Guard and Army Selected Reserve personnel, based on race, age, and sex. These weights ensure that the survey data more accurately describe the characteristics of reserve units and reserve personnel.

The remainder of this section summarizes the objectives, administration, and content of the surveys. Section II describes the sampling plan and sample selection process. Section III discusses the bias that nonresponse introduced in some important variables and explains the need for corrective weights. It also describes the weights

to be used with the random sample files (both the unit and personnel files) and justifies both their derivation and use. Section IV suggests the kind of analysis possible with these data.

The 1979 Reserve Force Studies Surveys collected the following kinds of data:

- Data on factors operating within the unit--factors that, when combined with data describing the surrounding community, explain differences in reserve force unit manning and readiness levels.
- Data on factors influencing enlistment and reenlistment decisions.
- Descriptive statistics from a representative sample of the reserve force enlisted and unit commander population.
- A baseline data set for a reserve force population sample that can be monitored in the future to analyze force attrition.

The collected data provide a unique description of the men and women currently in the Army reserve components. The factors underlying the success or failure of unit manning and readiness can be analyzed on the basis of the information gathered in the surveys.

Our research strategy was to sample the personnel and commanders of 441 Army National Guard and Army Reserve units of different authorized strength levels, in different geographical areas, and in different kinds of communities. Approximately one-half of the units were chosen randomly so that average unit and personnel characteristics could be studied. The rational for the sample plans and the survey response rate are described in detail in earlier Rand Notes.[1] In this Note, we summarize the sampling plans in Section II.

---

[1]See Zahava D. Doering, David W. Grissmer, Jennifer A. Hawes, *1979 Reserve Force Studies Surveys: Survey Design, Sample Design and Administrative Procedures,* N-1749-MRAL, August 1981. See also Zahava D. Doering, David W. Grissmer, Jennifer A. Hawes, *1979 Reserve Force Studies Surveys: User's Manual and Codebooks,* N-1755-MRAL, September 1981; and Jennifer A. Hawes, *1979 Reserve Force Studies Surveys: Description and Evaluation of Survey Procedures,* N-1750-MRAL, September 1981.

Little information is currently available concerning important aspects of the civilian life of reservists, including factors that influence enlistment and reenlistment decisions. These factors include civilian job characteristics, family income, past military history, and potential conflicts between civilian job requirements and reserve participation.

The second half of the sample was chosen to study unit manning, readiness, and location. We collected data describing reserve unit manning and readiness characteristics, including recruiting and training resources and strategies, equipment and facilities available for training, and unit commander attitudes and assessments. Community data include local population, types and wages of available jobs, size and characteristics of nearby educational institutions, and the existence of other reserve force units.

Because of the multiple purposes of these surveys and the large number of questions required to address some of the topics, we devised four separate questionnaires for the surveys.[2] These were designated forms 1 to 4.

Form 1, *1979 Reserve Force Personnel Survey for Grades E-1 to E-4,* collected data from all junior enlisted personnel who were members of the sample units at the time of the survey administration. The major part of the information collected in this questionnaire related to the first-term enlistment decision and to the characteristics and experience of the reservist prior to enlistment. A group of possible indicators of attrition and reenlistment behavior was also included, along with detailed economic and civilian labor force data.

Form 2, *1979 Reserve Force Personnel Survey for Grades E-5 to E-9,* was administered to all senior enlisted personnel, including unit technicians and training noncommissioned officers (NCOs), who were members of the sampled units at the time of the survey administration. This questionnaire, like Form 1, also collected detailed economic and civilian labor force data and possible indicators of reenlistment behavior. In addition, a major portion of the questionnaire focused on

[2]The survey forms are reproduced in Doering et al., August 1981, pp. 72-169.

the reservist's past military experience--both active and reserve--and his perceptions of the unit environment and manning problems.

Form 3, *1979 Reserve Force Commander Survey,* was completed by all unit commanders of the sampled units. This survey collected information about the commanders' characteristics, military and civilian backgrounds, and opinions about unit activities and environment.

Form 4, *1979 Reserve Force Unit Survey,* covered basic factual information about each sampled unit. This information was provided by either the unit commander or another unit member who was familiar with unit data, usually the unit technician or unit clerk.

Planning for the surveys began in January 1979. The surveys were fielded nationwide in late November 1979 to the sampled 224 Army National Guard units and 217 Army Reserve units, consisting at the time of the survey of approximately 39,000 enlisted personnel. Commanders of the selected units were responsible for collecting data during regular monthly drill assemblies. Each unit commander was responsible for completing one Commander Survey and one Unit Survey and for administering Personnel Surveys to all enlisted unit members.

The surveys were scheduled for completion in December 1979. The logistics of survey administration during drill assemblies and such operational requirements as unit maneuvers and emergency call-ups delayed completion of the data collection until July 1980.[3] After the survey was completed, the questionnaires were edited, processed, and converted into machine-readable files.

---

[3]See Hawes, September 1981, for details of survey administration and survey response.

II. THE SAMPLING PLANS[1]

To gather data with which to characterize the Army Reserve and Army National Guard populations, we drew a random sample of units and administered questionnaires to each unit member. Although statistically less efficient than simple individual random sampling, this method was thought to be less expensive and likely to achieve higher response rates. The determinants of unit manning levels could be modeled on the basis of sample data, and the models could be used to predict effects of policies applied to all reserve units.

To further identify factors that distinguish units at full strength from units below strength, we chose a second, case study sample. Unit manning levels are known to depend on the size and type of the unit. Smaller units (some have as few as ten members) are much easier to man than larger units. Also, other things equal, support units (transportation, supply, and maintenance, for example) have higher manning levels than combat units. We wanted to control for these factors so as to isolate other factors important to manning and readiness.

We chose six types of units and sampled between 27 and 50 units of each type. For each case study sample, we chose some units that were up to strength and some that were far below strength. The case study approach provided the best opportunity for identifying the invisible factors that may affect unit manning policy.

The combination of sampling requirements resulted in the selection of four separate and independent samples. A simple random sample of units was selected from the Army National Guard and a stratified random sample from the Army Reserve to satisfy the requirements for a random sample of individuals and a random unit sample. Two case study unit samples were chosen--one each from the National Guard and Army Reserve. Each case study sample consisted of three groups of specific unit types.

---

[1]See Zahava D. Doering, David W. Grissmer, Jennifer A. Hawes, *1979 Reserve Force Studies Surveys: Survey Design, Sample Design and Administrative Procedures,* N-1749-MRAL, August 1981, for a more complete description of the sampling plan.

RANDOM SAMPLE SELECTION

Selected Reserve units vary widely by size and function. National Guard units tend to be larger, more uniform in size, and higher in strength levels than Army Reserve units. They are also less diverse in terms of functions, tending to be predominantly combat units.

The heterogeneity of the Selected Reserve units poses a problem for a random unit sampling plan. A simple random sample of units would contain mostly small units: 53 percent of Army Reserve units, but only 6 percent of National Guard units, are authorized for 40 or fewer members. Yet the Army Reserve also has several extremely large medical units, containing over 160 personnel.

The characteristics of personnel in units of different size may differ widely. To ensure a sample representative of units of different size for the Army Reserve, we stratified the random sample by unit size. For the National Guard, a simple random unit sample was selected.

To support research in a broad range of policy concerns, determining sample sizes required establishing certain minimum statistical standards for the number of required returned questionnaires in specific reserve personnel groups. In particular, we wanted sufficient sample sizes so that data would be available with which to study the entire reserve life cycle from entrance to retirement, as well as to examine reserve subpopulations with and without prior military service.

The overall sample size was selected to balance the statistical concerns of obtaining an adequate sample for each stratified cell, whose total population is shown in Table 1, with certain political and budgetary constraints. Since senior personnel are a smaller proportion of the total reserve personnel, the statistical concern focused on obtaining an adequate sample of senior personnel.

The political constraint involved distributing the administrative burden evenly between the National Guard and the Army Reserve. This dictated that roughly equal numbers of units be sampled in each component.

Table 1

ENLISTED PERSONNEL OF THE ARMY NATIONAL GUARD AND ARMY RESERVE BY YEARS OF SERVICE AND PAY GRADE
(In thousands)

Years of Service	Pay Grade		Total
	E-1 to E-4	E-5 to E-9	
Army National Guard			
1 to 6	139	24	163
7 to 12	20	77	97
13 to 20	1	28	29
Over 20	0	18	18
Total	160	147	307
Army Reserve			
1 to 6	63	17	80
7 to 12	10	44	54
13 to 20	0	13	13
Over 20	0	8	8
Total	73	82	155

Finally, the resources for printing, distributing, collecting, editing, and scanning the surveys were limited. Fortunately, we had sufficient resources to obtain a statistically adequate sample in even the smallest cells. Resources were available to field 40,000 surveys.

Approximately one-half of the surveys were devoted to the random sample and one-half to the case study sample. This distribution allowed approximately equal samples of 110 units each in the National Guard and Army Reserve for the random sample. Assuming a 70 percent response rate, this sample size would provide 280 responses in the smallest cell--Selected Reservists with over 20 years of service.

For the National Guard, a simple random sample of 113 units was selected, or 3.6 percent of the units. Since a purely random sample of units would have produced a large number of small Army Reserve units, we stratified these units into four unit size groups and assigned different probabilities for selection to each category. Within a category, units were chosen randomly.

The total Selected Reserve sample consisted of 109 units (3.7 percent of all Selected Reserve units) almost evenly divided among the strata. Table 2 shows the distribution of the selected random sample for the two components by unit size.

CASE STUDY SAMPLE SELECTION

The type of units included in the case study samples had to meet several criteria. First, a sufficient number of units with identical functions and tables of organization (TOE) had to exist. To obtain a reasonable geographic dispersion and allow for different organizational environments, a minimum threshold of 25 units was established.

Furthermore, the selected unit types had to be such that the average strength for all units of that type was significantly below full strength. Also, individual units within a group of units of the same type had to show a reasonable dispersion of strength levels, i.e., some units at or above full strength and others significantly below strength. Finally, both combat and support types of units had to be included.

The six unit types for the case studies were selected from lists of units sorted by component (National Guard and Army Reserve), branch or function (Infantry, Armor, Transportation, etc.), authorized strength, and actual strength. For the Army National Guard, Infantry, Armor, and Engineer units were chosen for the Army Reserve, Transportation, Engineer, and Combat Support.

As shown in Table 3, between 45 and 50 units were selected from each unit type. Since Engineer units were selected from both the Army Reserve and National Guard, smaller samples from each component were considered appropriate.

Table 2

RANDOM SAMPLE OF ARMY NATIONAL GUARD
AND ARMY RESERVE UNITS

Unit Size	Number of Units		Number of Personnel	
	Universe	Sample	Universe	Sample
Army National Guard[a]				
0 to 40	205	4	4,700	140
41 to 100	1,108	46	73,800	3,036
101 to 161	1,305	46	141,900	5,000
Over 161	515	17	84,200	2,697
Total	3,133	113	304,600	10,873
Army Reserve[b]				
0 to 40	1,576	27	23,800	557
41 to 100	594	26	35,000	1,471
101 to 161	393	27	34,800	2,413
Over 161	351	29	85,700	3,523
Total	2,914	109	180,300	7,964

[a]Simple random sample of reserve units.

[b]Sample stratified by unit size.

Within each selected functional type, units were arrayed by average strength level computed as the ratio of actual to authorized strength. They were then divided into high, medium, and low strength, based on frequency distributions for each type of unit. Individual units within each unit type were predominantly selected from the high and low strength groups. Table 4 lists the selected units by function and average strength level.

Table 3

CASE STUDY SAMPLE BY FUNCTION, NUMBER OF UNITS, AND AVERAGE STRENGTH LEVEL

Function	Total Number of Units	Average Strength Level	Number of Sample Units
Army National Guard			
Armor	389	.83	44
Engineer	410	.92	28
Infantry	666	1.10	47
Army Reserve			
Combat support	197	.89	51
Transportation	128	.77	49
Engineer	262	.80	27

NOTE: The average strength level is the ratio of actual strength to authorized strength.

FINAL SAMPLE

Table 5 shows the number of reservists by pay grade in the Army National Guard and Army Reserve sample units assumed to be members of these units at the start of the fieldwork. Because these personnel counts were obtained several months prior to the fieldwork, they must be considered estimates of the numbers of individuals in the survey sample. Table 6 shows the number of units of each component in each sample.

Table 4

CASE STUDY SAMPLE BY FUNCTION AND STRENGTH LEVEL

	Low Strength (under .70)	Medium Strength (.70 to .90)	High Strength (over .90)	Total
Army National Guard				
Armor	18	8	18	44
Engineer	12	4	11	27
Infantry	22	6	19	47
Army Reserve				
Combat support	24	16	10	50
Transportation Corps	17	13	15	45
Engineer	11	9	6	26

NOTE: The average strength level is the ratio of actual strength to authorized strength. For the engineer units, we used the following strength levels: under .50, .50 to .70, and over .70.

Table 5

ESTIMATED NUMBER OF PERSONNEL IN THE 1979 RESERVE FORCE SURVEY SAMPLES

Category	National Guard	Army Reserve
Unit commanders	224	217
Enlisted personnel		
E-1 to E-4	11,275	10,193
E-5 to E-9	8,795	8,756
Total	20,072	18,949

Table 6

FINAL SAMPLE STRATIFICATION OF ARMY NATIONAL GUARD AND ARMY RESERVE UNITS

	Number of Sample Units	
Army National Guard		
Case study sample		
Armor	42	
Engineer	25	
Infantry	44	
Total case study sample	111	
Random sample	113	
Total National Guard sample		224
Army Reserve		
Case study sample		
Combat support	45	
Transportation	45	
Engineer	21	
Total case study sample	111	
Random sample	106	
Total Selected Reserve sample		217
Total sample		441

III. WEIGHTING TO CORRECT FOR NONRESPONSE BIAS

SURVEY RESPONSE RATES

The response rates for this study were computed as the number of questionnaires completed by eligible sample members divided by the total number of eligible sample members. These calculations followed the formula suggested in the American Statistical Association report on methods for assessing survey practices.[1]

Using this approach, we calculated the response rate for the surveys of enlisted personnel as the ratio of the number of completed Enlisted Personnel Surveys to the number of enlisted personnel assigned to the sampled units at the time of the survey administration.[2] For the Unit and Commander Surveys, response rates were calculated as the number of sampled units for which completed questionnaires were received divided by the total number of sampled units.

Overall survey response rates for each of the four questionnaires used in this study are presented in Table 7. The unit commanders were diligent in completing the two questionnaires designed for their use, namely, the Unit and Commander Surveys. In both the Army Reserve and the Army National Guard, the completion rates for these two surveys were over 80 percent, well over our projected response rate of 70 percent for all surveys.

---

[1]Barbara A. Bailar and C. Michael Lanphier, *Development of Survey Methods to Assess Survey Practices,* American Statistical Association, Washington, D.C., 1978.

[2]The data pertaining to the number of enlisted personnel who were members of the sampled units at the time of the survey were tabulated from the completed Unit surveys. Using unit records of actual personnel strength, the unit commander recorded the required data in the Unit Survey. For units that did not return completed Unit Surveys (approximately 18 percent of the sample), the personnel data were abstracted from the reserve personnel files available at the time of sample selection, i.e., as of July or August 1979, based on the Reserve Components Personnel Data System.

Table 7

RESPONSE RATES FOR SURVEY FORMS

Survey Form	Army National Guard		Army Reserve		Total Sample Size	Average Response Rate
	Sample Size	Response Rate	Sample Size	Response Rate		
Unit[a]	224	80.8%	217	83.4%	441	82.1%
Commander[a]	224	79.9%	217	82.5%	441	81.2%
E-5 to E-9[b]	8,722	66.9%	9,099	63.2%	17,821	65.1%
E-1 to E-4[b]	11,341	52.8%	10,445	44.2%	21,786	48.5%

[a]Sample size is the number of units included in the survey.

[b]For units that returned completed Unit Surveys, the sample size is the number of enlisted personnel in each pay-grade group reported in the survey. For units that did not return completed Unit Surveys, sample size is based on the number of enlisted personnel in each pay-grade group at the time of sample selection, i.e., as of July or August 1979, based on the Reserve Components Personnel Data System.

The rate of returned questionnaires from enlisted unit members, however, fell below the projected 70 percent to 65 percent for senior enlisted personnel and under 49 percent for junior enlisted personnel. The completion rate of 53 to 67 percent for Army National Guard enlisted personnel was slightly higher than the 44 to 63 percent obtained from Army Reserve enlisted personnel.[3]

An alternative way to look at response rates is to examine the unit-specific response rates for the Enlisted Personnel Surveys. Our analysis of fieldwork data shows that response rates among enlisted personnel varied greatly among sampled units. A high unit response rate

[3]Unfortunately, the response rate to the Enlisted Personnel Surveys was depressed by about 4 percent as a result of the loss in the U.S. mail of five boxes containing approximately 1500 completed questionnaires that were being sent from DMDC in Alexandria, Virginia, to the optical scan contractor, Intran, in Minneapolis, Minnesota.

indicates that the unit commander administered the personnel surveys to a large percentage of the enlisted unit members, with few refusals and absences. Lower-than-expected unit response rates may have resulted from individual refusals to participate or low attendance at monthly reserve unit drills.

The existence of "split" reserve units may also have negatively affected response rates. We found that roughly 20 percent of the units selected for sampling were organized into two or more sections that drilled at different times and in different geographical locations. Enlisted response rates in these split units may have been lower because the units failed to administer the surveys to enlisted members at all unit drill locations. The relatively low response rates for junior enlisted members depressed the overall response rates for unit enlisted personnel.

NONRESPONSE BIAS IN THEORY

This section examines nonresponse bias and the assumptions underlying various compensation procedures.[4] Consider a simple random sample of size n drawn from a population of size N. We are interested in estimating the population mean for a single variable $\bar{Y}$.

Let R be the number of respondents and M the number of nonrespondents in the population, so that R + M = N; the corresponding sample figures are r and m with r + m = n. Let $\bar{R}$ = R/N and $\bar{M}$ = M/N be the proportions of respondents and nonrespondents in the population; then $\bar{r}$ = r/n and $\bar{m}$ = m/n are the corresponding sample response and nonresponse rates. The population mean for the variable Y is $\bar{Y} = \bar{R}\bar{Y}_R + \bar{M}\bar{Y}_M$, i.e., the population mean is a weighted sum of the means for respondents and nonrespondents, $\bar{Y}_R$ and $\bar{Y}_M$, respectively, the weights being the proportions of respondents and nonrespondents.

If no compensation is made for nonresponse, the respondent sample mean, $\bar{y}_r$, is used to estimate $\bar{Y}$. Its bias is given by:

---

[4]This section draws heavily on Graham Kalton, "Compensating for Missing Survey Data," Survey Research Center, Institute for Social Research, The University of Michigan, Research Report Series, 1983.

$$\text{Bias } (\bar{y}_r) = \bar{Y}_R - \bar{Y} = \bar{M}(\bar{Y}_R - \bar{Y}_M)$$

This shows that $\bar{y}_r$ is approximately unbiased if either the proportion of nonrespondents $\bar{M}$ is small or $\bar{Y}_M$ is close to $\bar{Y}_R$, i.e., the means for both the respondent and nonrespondent groups are similar. If, as in the Enlisted Personnel Surveys, the proportion of nonrespondents is large, then the suitability of $\bar{y}_r$ as an estimator of $\bar{Y}$ depends on the assumption that $\bar{Y}_r$ and $\bar{Y}_m$ are close in value. In other words, the choice not to compensate for missing data involves the implicit assumption that respondents and nonrespondents have similar means.

As Kalton points out, given fairly sizable nonresponse rates, it is far better to adopt some form of compensation procedures based on explicit and realistic assumptions rather than simply to analyze the respondent data.

Different types of weighting adjustments may be used to ensure that the survey data conform closely to the survey population. The method used here is poststratification weighting.[5] The development of poststratification weights requires that information be available on the distribution of the survey population over different subgroups of the sample, often referred to as *weighting classes.* The weighting factors are then based on the population totals for the weighting classes. The data from the respondent sample are then weighted so that their weighted distribution over the classes conform to that of the original survey population.

Poststratification or stratification after selection is basically an adjustment or correction of the mean. The effect of stratification is introduced into the estimation process in an effort to make the sample proportionate to the population. This is an example of improving the estimator by the proper utilization of ancillary sources of information.

---

[5]For a discussion of this method, see Leslie Kish, *Survey Sampling,* John Wiley and Sons, Inc., New York, New York, 1965.

For example, assume that we can classify sample cases into H strata and also obtain the proportions w_h and W_h of these strata in the sample and population, respectively. The weighted population mean $\bar{Y}'$ is given by:

$$\bar{Y}' = \Sigma\, W_h \bar{Y}_h = W_1 \bar{Y}_1 + W_2 \bar{Y}_2 + \ldots + W_H \bar{Y}_H$$

i.e., the population mean is equal to the sum of the H strata means $\bar{Y}_h$ multiplied by their weights W_h, where $\Sigma\, W_h = 1$. The uncorrected sample mean,

$$\bar{y} = \Sigma\, w_h\, \bar{y}_h,$$

has

$$\text{Bias } (\bar{y}) = (\Sigma\, w_h E\bar{y}_h - \Sigma\, W_h \bar{Y}_h)$$

$$= \Sigma\, W_h (E\bar{y}_h - \bar{Y}_h) + \Sigma\, (w_h - W_h) E\bar{y}_h$$

$$= \Sigma\, W_h (E\bar{y}_h - \bar{Y}_h) + \Sigma\, (w_h - W_h)(E\bar{y}_h - E\bar{y}),$$

where $E\bar{y}_h$ is the expected value of y among respondents in stratum h. The poststratification procedure computes a weighted sample mean as:

$$\bar{y}' = \Sigma\, W_h \bar{y}_h,$$

which has

$$\text{Bias } (\bar{y}') = \Sigma\, W_h (E\bar{y}_h - \bar{Y}_h).$$

This procedure, of course, cannot guarantee removal of nonresponse bias from the sample. If the nonrespondents within each group h are a random sample of the total respondent and nonrespondent sample for that group (choice-based sample), then we would have $E\bar{y}_h = Y_h$ and the weighting procedure would remove nonresponse bias. However, this procedure cannot completely remove bias for variables for which data are available in the sample only.

Typically, certain variables (demographic) will be available for both the population and sample, and other variables will be gathered for the sample only. Some subset of the former will be used to define the H classes and weights. These weights will then be used to derive means of variables found in the sample only. No weighting procedure can guarantee absence of bias in the means of the latter set of variables unless selection is truly random within each class. Since the causes of nonresponse are usually not simple random procedures, an unknown bias will remain.

NONRESPONSE BIAS IN THE SURVEY

The random sample file was separated into (a) the unit file containing information from the Form 4 questionnaire filled out by the unit technician or unit commander and (b) the personnel file containing the data from the Form 1 and Form 2 questionnaires filled out by E-1 to E-4 and E-5 to E-9 reservists, respectively. The Unit Commander survey for the random sample cannot be weighted because of the lack of personnel data defining the universe for unit commanders. However, the high response rate for this questionnaire makes nonresponse a less troublesome issue. The Unit Commander survey response rates exceeded 80 percent for each guard and reserve sample.

Nonresponse Bias in the Random Sample Unit Survey File

We compared the Army Reserve and Army National Guard respondent unit files with the unit survey population file across several variables relating to unit strength and unit size. Tables 8 and 9 present the distribution of the sample and the population by enlisted structure strength, enlisted authorized strength, enlisted operating strength, and enlisted strength present for annual training for the two components, respectively.

The distributions appear to be fairly similar for the National Guard population and sample units. The Army Reserve sample, however, appears to differ markedly from the expected stratified sample, with a larger response from larger units.

To test the significance of the observed differences in the distribution of the variables across the survey sample and survey population, we used the chi-square (χ^2) test. The null hypothesis was one of no difference between the survey sample and population distribution across any of the selected variables.[6]

---

[6]One computes a set of expected or theoretical frequencies for the sample based on the assumption that the null hypothesis is true. The observed frequencies are then compared to the expected frequencies. The chi square is computed as $\chi^2 = \Sigma\ (f_o - f_t)^2/f_t$, where f_o is the observed frequency and f_t is the theoretical frequency. If the computed chi square is greater than the value of the chi square given in the chi-square distribution table for the appropriate degrees of freedom and the selected level of significance, the null hypothesis is rejected.

Table 8

COMPARISON OF SURVEY POPULATION AND FORM 4 SAMPLE OF ARMY RESERVE UNITS

Variable	Unit Size				
	0-40	41-100	101-160	161+	Total
Enlisted structured strength					
Survey population	54.1	18.1	12.9	15.0	100.0
Survey sample	25.0	22.7	21.6	30.7	100.0
Enlisted authorized strength					
Survey population	54.1	20.4	13.4	12.1	100.0
Survey sample	25.0	23.9	23.9	27.3	100.0
Enlisted operating strength					
Survey population	57.8	28.3	10.1	3.8	100.0
Survey sample	31.8	42.1	22.7	3.4	100.0
Enlisted present for annual training					
Survey population	67.1	26.6	5.2	1.1	100.0
Survey sample	47.7	39.8	12.5	--	100.0

Table 10 presents the results of the chi-square test comparing the sample and population distribution; it also reports the critical value of chi square for 0.05 level of significance. We cannot, in any instance, reject the null hypothesis for the National Guard units. However, we reject the null hypothesis of no difference between the survey sample and survey population for the Army Reserve units.

Table 9

COMPARISON OF THE SURVEY POPULATION AND FORM 4 SAMPLE OF NATIONAL GUARD UNITS

Variable	Unit Size				
	0-40	41-100	101-160	161+	Total
Enlisted structured strength					
Survey population	7.4	28.1	36.1	28.5	100.0
Survey sample	2.2	33.3	37.6	26.9	100.0
Enlisted authorized strength					
Survey population	6.5	35.4	41.1	17.0	100.0
Survey sample	2.2	39.8	43.0	15.0	100.0
Enlisted operating strength					
Survey population	8.1	50.5	33.5	7.9	100.0
Survey sample	4.3	53.8	34.4	7.5	100.0
Enlisted present for annual training					
Survey population	16.8	63.1	18.1	2.0	100.0
Survey sample	16.1	63.4	20.4	--	100.0

Table 10

RESULTS OF CHI-SQUARE TESTS COMPARING SURVEY POPULATION AND FORM 4 SAMPLE

	Army National Guard	Army Reserve	χ^2 0.05
Enlisted structured strength	4.60	35.98	7.8
Enlisted authorized strength	3.50	39.04	7.8
Enlisted operating strength	2.20	29.60	7.8
Enlisted present for annual training	2.30	19.40	7.8

NOTE: Each chi-square statistic has 3 degrees of freedom.

We decided to weight the Army Reserve unit file using enlisted authorized strength. We did not weight the National Guard unit file, as it was already representative of the population. Poststratification weights for the Army Reserve units are given in Table 11.

Nonresponse Bias in the Random Sample Form 1 and Form 2 Combined Personnel File

We examined the extent of nonresponse bias in the personnel sample composed of Form 1 and Form 2 respondents by comparing the distribution of the survey population with the sample across various demographic variables, as shown in Table 12. Notice that the survey sample, irrespective of component, has fewer young people, fewer reservists in the E-1 and E-2 pay grades and a much higher population of personnel with some college education than the survey population. We computed chi square to test the significance of these differences; the results are reported in Table 13. As the table makes clear, in almost every case, we were forced to reject the null hypothesis of no significant

Table 11

POSTSTRATIFICATION WEIGHTS FOR ARMY RESERVE UNITS IN RANDOM SAMPLE

Enlisted Authorized Strength	Proportion in Survey Population	Expected Frequency[a]	Observed Frequency	Weight[b]
0 to 40	.54	48	22	2.19
41 to 100	.20	18	21	0.88
101 to 160	.13	11	21	0.52
Over 161	.12	11	24	0.46

[a]Expected frequency is calculated by multiplying the total number of survey sample units (88) by the proportion that each cell accounted for in the survey population (column 1).

[b]Weight is the expected frequency divided by the observed frequency.

Table 12

COMPARISON OF SURVEY POPULATION AND FORMS 1 AND 2 COMBINED ENLISTED PERSONNEL FILE BY DEMOGRAPHIC VARIABLE

Variable	Army National Guard		Army Reserve	
	Survey Population	Survey Sample	Survey Population	Survey Sample
Sex				
Male	95.4	95.5	86.4	86.7
Female	4.6	4.5	13.6	13.3
Total	100.0	100.0	100.0	100.0
Race				
Black	18.2	15.8	28.4	23.9
Nonblack	81.8	84.2	71.6	76.1
Total	100.0	100.0	100.0	100.0
Age group				
17 to 20 years	16.5	14.0	12.5	8.0
21 to 24 years	22.1	20.2	18.3	15.9
25 to 29 years	18.4	18.6	21.0	23.0
30 to 36 years	22.6	25.2	27.7	31.1
Over 37 years	20.4	22.0	20.5	22.0
Total	100.0	100.0	100.0	100.0
Pay grade				
E-1	10.7	7.1	7.0	4.1
E-2	9.9	7.1	10.9	4.6
E-3	10.4	10.8	8.1	8.2
E-4	21.0	22.1	22.0	25.1
E-5	24.2	27.5	22.9	27.4
E-6	14.7	16.0	15.7	17.2
E-7	6.8	7.1	9.7	9.3
E-8	1.9	2.0	2.9	3.2
E-9	.4	.3	.8	.9
Total	100.0	100.0	100.0	100.0
Education				
Less than high school	32.2	25.6	27.1	16.9
High school graduate	63.1	51.8	61.0	49.3
Some college	4.7	22.6	11.9	33.8
Total	100.0	100.0	100.0	100.0

Table 13

RESULTS OF CHI-SQUARE TESTS COMPARING SURVEY POPULATION AND FORMS 1 AND 2 COMBINED ENLISTED PERSONNEL FILE

Variable	Army National Guard	Army Reserve	χ^2 0.05
Race	24.2	41.0	3.8
Sex	0.3	0.3	3.8
Age	48.9	96.4	9.5
Pay grade	165.3	276.5	15.5
Education	4206.5	1904.7	6.0

NOTE: Chi square may be biased because of clustering.

differences between the survey sample and the survey population. This implied that our respondent sample was not representative of the survey population, at least with regard to these particular variables.

Weighting the Survey Form 1 and Form 2 Combined Personnel File

At first glance, it appeared that we should weight by pay grade and/or education. We learned, however, that the updating of the personnel file lagged with respect to both of these variables.

The information that we obtained from the survey might plausibly have been more current than the distribution shown in the reserve personnel files from which the survey population data were obtained. In fact, education variables on this file often reflect education at enlistment; these cases would account for the high chi square. Pay grade is likely to lag by only a few months. We, therefore, stratified the population by age group, sex, and race.

Table 14 presents the comparison of the sample and the population for these strata. Poststratification weights were then computed, as shown in Table 15.

Table 14

COMPARISON OF SURVEY POPULATION AND FORMS 1 AND 2 COMBINED ENLISTED PERSONNEL FILE BY STRATIFICATION VARIABLE

Variable	Army National Guard		Army Reserve	
	Survey Population	Survey Sample	Survey Population	Survey Sample
17 to 20 years old	16.5	14.7	12.6	7.9
Black males	2.8	2.5	2.9	1.5
Nonblack males	12.8	11.3	7.9	5.5
Black females	.2	.2	.6	.4
Nonblack females	.7	.7	1.2	.5
21 to 24 years old	22.1	20.5	18.3	16.2
Black males	5.2	4.1	5.3	3.3
Nonblack males	15.4	14.8	9.6	9.1
Black females	.5	.3	1.2	1.5
Nonblack females	1.0	1.2	2.2	2.3
25 to 29 years old	18.4	18.4	21.0	23.1
Black males	3.7	3.1	5.6	5.0
Nonblack males	13.5	14.2	11.2	13.8
Black females	.4	.3	1.7	1.9
Nonblack females	.8	.8	2.5	2.4
30 to 36 years old	22.6	24.7	27.7	30.6
Black males	3.4	3.1	6.0	5.3
Nonblack males	18.5	20.9	18.5	22.0
Black females	.2	.2	1.4	1.4
Nonblack females	.5	.5	1.8	1.9
Over 37 years old	20.4	21.7	10.4	22.1
Black males	1.8	1.3	3.3	3.0
Nonblack males	18.3	20.2	15.9	18.2
Black females	.1	.04	.4	.2
Nonblack females	.2	.2	.8	.7

NOTE: Some of the subtotals for particular groups may not add to those reported in Table 12, owing to missing data and rounding.

Table 15

POSTSTRATIFICATION WEIGHTS FOR FORMS 1 AND 2 COMBINED ENLISTED PERSONNEL FILE, BY COMPONENT

Cell	Army National Guard	Army Reserve
17 to 20 years old		
Black males	1.12	1.93
Nonblack males	1.13	1.44
Black females	1.00	1.50
Nonblack females	1.00	2.40
21 to 24 years old		
Black males	1.27	1.61
Nonblack males	1.04	1.05
Black females	1.67	.80
Nonblack females	.83	.96
25 to 29 years old		
Black males	1.19	1.12
Nonblack males	.95	.81
Black females	1.33	.89
Nonblack females	1.00	1.04
30 to 36 years old		
Black males	1.10	1.13
Nonblack males	.89	.84
Black females	1.00	1.00
Nonblack females	1.00	.95
Over 37 years old		
Black males	1.31	1.13
Nonblack males	.91	.87
Black females	2.50	1.50
Nonblack females	1.00	1.14

NOTE: Weights are derived by dividing expected frequency in a cell by observed frequency. See Table 11.

IV. APPLICATIONS OF THE WEIGHTED DATA

Data from the 1979 Reserve Force Studies Surveys can be used to study the enlistment and reenlistment decisions and the attrition of Army Reservists and Army National Guardsmen. These data may be used, for example, to expand a 1978 Rand study of reenlistment decisions of reservists, which focused on decisions made by reservists who had served from 3 to 8 years with no prior service.[1]

The 1978 study led to a statistical model based on survey data collected at the point of the reenlistment decision.[2] The model was based on actual reenlistment behavior. The work showed important determinants of reenlistment to be the demographic composition of the reenlisting cohort, certain characteristics of the civilian job, civilian wage rates, reserve pay levels, military rank, type of military job, and motivation at entrance. Data from the 1979 Reserve Force Studies Surveys can be used to extend this work to personnel with prior service and to all personnel with between 3 and 20 years of service.

The extension of the 1979 surveys to personnel with prior service will be important because they constitute approximately one-half of reserve accessions and their reenlistment behavior is known to be characterized by one-year extensions and breaks in service. Models of both prior- and nonprior-service personnel will allow improved determination of the optimal accession mix for the two groups, as determined by the long-term costs and reenlistment behavior of each group.

An important extension allowed by the new data is the modeling of multiyear reenlistment behavior for both groups. The 1979 surveys collected 20 years of historical data on participation in either active or reserve components. These data can be used in two ways. First, one

---

[1]See David W. Grissmer, Zahava D. Doering, Jane Sachar, *The Design, Administration, and Evaluation of the 1978 Selected Reserve Reenlistment Bonus Test,* R-2865-MRAL, July 1982.

[2]See Burke K. Burright, David W. Grissmer, Zahava D. Doering, *A Model of Reenlistment Decisions of Army National Guardsmen,* R-2866-MRAL, October 1982.

might hypothesize that previous breaks in reserve service would be important predictors of future service. Thus, the information on past history can be included in the reenlistment model.

The information can also be used to explore the delay between separation from the active force and enlistment in the reserve forces. Prior service reservists often do not join the reserve unit until several years after active force separation. Closing this gap can be important to reserve strength levels, but little is known about the length of or reasons for the delay.

Knowledge of this kind will be particularly important in determining how long the large Vietnam era pool of prior service personnel will be available to the reserves. It will also suggest how to implement policies to attract a larger share when the decline in the pool occurs.

The extension of reenlistment modeling to include more senior reservists will also allow the evaluation of the importance of reserve retirement benefits in reenlistment decisions. The effects of reducing benefits may be predicted from such models.

Data from the reserve force surveys also contain a richer set of potential determinants of reenlistment behavior. In particular, many variables describing the unit and community environment are available for analysis, including training and equipment characteristics, unit morale and manning levels, and workloads and unit resources.

One important methodological advance that can be addressed with the data concerns the use of intentions versus behavior in modeling reenlistment behavior. The survey collected intentions to reenlist based on a ten-point probability scale. By matching the survey data with personnel files through social security numbers, the actual reenlistment behavior can be ascertained and compared with the intentions data.

Work with active force data has established that intention data are quite reliable and provide estimates similar to coefficients of reenlistment models.[3] One would probably hypothesize a weaker

---

[3]See Winston K. Chow, J. Michael Polich, *Models of the First-Term Reenlistment Decision, R-2468-MRAL, September 1980.*

connection between the intentions and behavior of reservists, owing to the weaker attachment (full versus part-time) to the military job and greater uncertainty in civilian job demand and family attitudes. Therefore, a finding for reservists similar to that for active forces would allow improved forecasting of reserve reenlistment behavior as well as easier development of reenlistment models.

The 1979 survey data will also allow a more complete analysis of reserve attrition behavior. Analysis to date has been restricted to statistics collected from reserve personnel cohort files. While these files can provide excellent data on the longitudinal history of individual reservists, they contain a limited set of variables that can be used to model attrition. Only demographic variables, Armed Forces qualification test data, and military rank and occupation are available.

The new data provide information on the civilian labor force status, characteristics of the civilian job, civilian wage levels, family and marital status, and employer attitudes towards the reserve. In addition, they offer many variables describing the unit environment, including training and equipment characteristics, morale, and manning levels. By matching survey and personnel files to determine which of the survey participants have left, fairly comprehensive attrition models can be developed.

The unit survey contains descriptive data on a recent nonprior-service attrition decision. These data, provided by the unit commander or technician, allow an evaluation of the individual who left and the reason for his leaving. We do not now know how much attrition is the normal winnowing of undesirable personnel initiated by unit commanders and how much is the loss of desirable personnel.

In addition to analyzing individual behavior, the survey data can be used to explore unit locations. It has also been suggested that reserve units and requirements are not geographically distributed to take advantage of population distributions and the different propensities to enlist among different segments of the population. This suggestion had led to proposals for a geographic realignment of units and/or requirements. Geographic realignment would lead either to increased manning at the same overall costs or to the same manning at reduced costs.

Current proposals to expand the reserve forces would also require decisions regarding new unit locations. One important consideration in this decision will be the likelihood of acquiring needed manning levels from the community. These survey data can be used to model the relationship between unit manning levels and community characteristics while holding constant certain unit characteristics. Census data are being prepared to merge with unit data so that a more complete picture of the community can be obtained.

Finally, the Unit Commander surveys can be used to characterize reserve unit commanders and obtain their assessments of reserve problem areas for different kinds of reserve units. Such assessments were obtained for personnel, equipment, and training resources. Many believe that the experience, management skills, and dedication of unit commanders explain much of the variance in unit readiness and manning levels. Data from this instrument can be combined with unit data to test the hypothesis that various characteristics of the unit commander are important to these variables.