The Military Enlistment Process

What Happens and Can It Be Improved?

Sue E. Berryman, Robert M. Bell,
William Lisowski

35th Year Rand

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PREFACE

This report was prepared as part of Rand's Manpower Mobilization and Readiness Program, sponsored by the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics) under Contract number MDA903-80-C-0652. It should interest those members of the military services and of the Office of the Secretary of Defense who want to know how many nonprior service, active-duty applicants exit from the recruiting process, their characteristics and at which stages they exit, and the prospects for retaining and enlisting applicants who currently are lost. It should also be useful as an information source for military managers who are responsible for the effectiveness and efficiency of the services' recruiting operations.

SUMMARY

This report examines the military enlistment process by tracing the behaviors of individuals who applied for active duty in fiscal year 1977. It is based on the FY77 Applicant Cohort File, specially constructed by the Defense Manpower Data Center (DMDC) at Monterey, California. The applicant cohort consisted of nonprior service applicants to the four military services who had taken the Armed Services Vocational Aptitude Battery (ASVAB) and/or medical examination in FY77 and who had no record of testing subsequent to FY77. The file tracked this group through January 1979 to determine the final outcome of their application. Thus, for example, applicants who qualified in 1977 but enlisted and entered active duty in FY78 were defined as accessions (active-duty entrants).

We used the file for three purposes: (1) to assess how many FY77 applicants to each service exited from the process, when they exited, and who they were; (2) to evaluate the amount and nature of similarity between each group that exited and those that accessed; and (3) to show how changes in the data base, computer technology, and software available to the recruiting commands could improve the ability of service and Department of Defense managers to monitor the efficiency and effectiveness of the recruiting system.

The recruiting process covered by the file consists of several steps in the following sequence: taking the ASVAB, taking the medical examination, enlisting in the Delayed Entry Program (DEP), accessing from the DEP, or enlisting and accessing simultaneously. For our

purposes accession defined the end of the process. Each stage prior to it could have one of three outcomes: fail and exit, pass and exit, or pass and proceed to the next stage.

For FY77 we found that the services accessed about half of all applicants who entered the test process. They rejected a fifth of them. Of all applicants, 16 percent failed to meet service Armed Forces Qualification Test (AFQT) standards for individuals of their gender and educational attainment. Four percent of all applicants failed the medical examination; among those who took the medical examination, the failure rate was 7 percent. Only a trivial percent (two-tenths of a percent) who started the test process failed for other reasons, e.g., moral disqualifications.

The remaining applicants--almost 30 percent of the total--consisted of partially or fully qualified applicants whom the services did not enlist. The partially qualified (PQ) losses constituted a relatively ignored and large source of applicant loss: 179,000, or 25 percent of all applicants. These individuals met service AFQT standards, but did not complete the qualification process. Compared with the number of PQ losses, the numbers of fully qualified, not enlisting (QNE) losses and DEP discharges were small. Combined, these two groups represented only 3.9 percent of all applicants and 7 percent of all fully qualified applicants.

In examining the effects of applicant background characteristics (e.g., sex, age, educational attainment) on accession rates, we found that (1) AFQT failures and PQ losses always constituted the largest losses; (2) for most characteristics, AFQT failure rates, PQ loss rates, and QNE loss rates varied systematically with changes in the values of

the characteristic (e.g., QNE rates increased as age increased); (3) when medical failure rates varied, the variation was partly attributable to age; and (4) the measured background characteristics did not particularly affect DEP discharge rates, even when variations in losses prior to DEP enlistment had been eliminated.

Females had a much lower accession rate than males, even when we took into account that in FY77 some military services had higher AFQT and educational standards for women than for men. Race and ethnicity had only a small effect on accession probabilities, whites accessing at somewhat higher rates than blacks or Hispanics. However, this variable was associated with differences in the source of losses. Blacks and Hispanics had triple the AFQT failure rate of whites; whites had higher PQ and QNE loss rates than blacks.

As age increased, accessions decreased. The age effect was attributable to differences in PQ, medical failure, and QNE loss rates, rather than to differences in AFQT failure and DEP discharge rates.

Educational attainment had a curvilinear effect on accessions. High school nongraduates were less likely to access than GED and high school graduates, primarily because nongraduates had much higher AFQT failure rates. Those with at least a year of college had the lowest accession rate, primarily because they had very high PQ and QNE loss rates.

Among those who passed the AFQT, accession rates increased as AFQT categories declined from I to IIIB. The accession rate differences were attributable to small but steady decreases in PQ and QNE losses as AFQT category declined.

Average annual income of the applicant's zip code area had little effect on accessions, but did affect the pattern of losses from the recruiting process. Not surprisingly, income was systematically and negatively related to AFQT failure and positively related to PQ and QNE losses.

Being married depressed accession rates, the negative effect increasing with the number of dependents. Marriage and children affected accession rates by increasing PQ, medical failure, and QNE loss rates, and had no particular effect on AFQT failure rates.

After classifying the applicant's residence on an urban-rural continuum, we found little effect on accessions. Coming from more rural counties slightly increased accessions by decreasing PQ and QNE losses.

When we divided the nation into 26 areas that differed in social and economic opportunities for residents, we found that accession rates varied by only about 10 percent across the areas. The sources of loss, however, varied dramatically. AFQT failure rates ranged from 6 percent to 28 percent; of all those who qualified mentally, PQ loss rates varied from 14 percent to 32 percent.

We used discriminant analysis of enlistment-relevant applicant characteristics (e.g., educational attainment) to assess the degree and nature of similarity between accessions and each group that exited from the recruiting process. This analysis can show whether an exit group may be a "missed" accession group. If the analysis reveals strong similarities between accessions and an exit group and the FY77 results can be generalized to later years, the services may be processing more applicants than they need to meet accession requirements. Recruiting

markets can also shift dramatically, as the change from FY79 to FY81 shows. In this case, similarity between an exit group and accessions implies that the services may have more potential accessions in their recruiting nets than they realize.

This analysis tells us only if a FY77 applicant group that exited from the process was similar to FY77 accessions and only for variables measured in the data base. If, for example, the PQ group was similar to accessions, we cannot conclude that the PQ losses could have been enlisted with the same incentives that attracted the accessions. The two groups may differ on characteristics not measured in the data base. We can conclude that the services cannot rule out this possibility and that the possibility is stronger after the test for differences than it was before the test.

For male applicants we found that the rank order of differences between exit group and accessions was: AFQT failures > QNE losses > medical failures > PQ losses > DEP losses. The amount of distance between the multivariate means of each exit group and accessions was, respectively, 1.01 (a standard deviation), 0.85, 0.59, 0.53, and 0.27 (about a quarter of a standard deviation). If we compared only the distances of the first and last exit groups in the rank order (AFQT failures versus DEP losses), we would conclude that the FY77 recruiting process created an increasingly homogeneous applicant population, presumably by the cumulative elimination of those not wanted by and those who did not want to join the services. However, the full rank order reveals a reversal between the PQ and QNE losses, the latter differing from accessions by over a quarter of a standard deviation more than PQ losses.

After examining the amount and nature of differences between each exit group and accessions, we concluded the following for FY77.

1. The PQ losses were a potential source of accessions. Because of their large numbers and AFQT and educational distributions, they were a large potential source of quality accessions.
2. Had the services reduced medical standards, the evidence suggests that most medically disqualified applicants would have accessed.
3. The QNE losses were a much less likely potential source of accessions than the PQ losses.

The military services and DoD have multiple and somewhat redundant data (information) systems on applicants. Not all services have centralized data on the number of recruiter contacts and appointments (such data may not be useful enough to warrant their routine entry). None have on-line access to data on applicants prior to signing an enlistment contract. Computer entry of transactions on applicants (except for enlistments and accessions on service-unique systems) is delayed. Only the Air Force can associate management levels other than the recruiter with applicants before enlistment.

We recommend a single joint DoD/service, on-line, instantaneous data entry system that spans the process from at least the ASVAB (and perhaps appointment) to accession. By "joint DoD/service" we mean a system of information about applicants to all services, with the data elements common to all services. We do not mean that a service could access information on applicants to other services. Both the private

and public sectors have effective "lock out" methods to prevent unauthorized access to computerized data bases.

To implement this recommendation, we suggest that the services introduce the hardware required for on-line access and instantaneous data entry. To use the capability that such systems provide, we also suggest that the services develop the software packages that allow managers at different levels of the recruiting command to manipulate the data to answer management questions.

We recommend that a joint DoD/service committee, including members of the Military Enlistment Processing Command and DMDC, assess the quality of each data element now entered into the basic information system--the Armed Forces Examining and Entrance Station Reporting System. If an element is found to be of unacceptable quality, we recommend that those concerned about that element's accuracy (e.g., recruiters) work out a solution.

We recommend that a joint DoD/service committee, including representatives from the service personnel policy offices, MRA&L, and the different functions of the recruiting commands (e.g., marketing), periodically review the data elements routinely collected on applicants. Such a committee should consider adding certain data elements.

We give six examples of how managers could use the proposed system: (1) to improve national and local marketing; (2) to assess the effects of changes in enlistment incentives; (3) to improve recruiter selection and assignment to territories; (4) to locate unusually effective and ineffective recruiters, recruiting stations, recruiting areas, or district recruiting commands, using PQ loss rates and other applicant outcomes as effectiveness criteria; (5) to monitor the processing of

applicants, especially to flag applicants in a PQ status; and (6) to substitute a more accurate computer file on each applicant for the cumbersome paper trails that now exist.

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Members of DMDC at Monterey, California, especially Robert Brandewie, Jane Crotser, and Les Willis, were responsible for building the data file required by the project. The task was difficult, and their strong commitment to it deserves special recognition.

Many individuals in the service recruiting commands and in the U.S. Military Enlistment Processing Command (MEPCOM) contributed in person and by telephone. We owe a special debt to members of Headquarters, U.S. Army Recruiting Command, at Fort Sheridan, and to the officers and enlisted personnel of the Army district recruiting commands at Los Angeles and Santa Ana. They helped us to understand military recruiting operations and thus to interpret our data more thoughtfully. They gave us our first clues to changes in applicant data systems that would be helpful to all services.

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I. INTRODUCTION

This report measures and assesses the recruiting processes of the active-duty military services during one recent fiscal year (FY77). It has three objectives: (1) to determine how many applicants failed to enter active-duty in one of the four services, how these losses were distributed over the application process, and the characteristics of applicants lost at different stages; (2) to pinpoint differences between applicants lost at each stage and applicants who accessed; and (3) to indicate possibilities for improving the collection of recruiting information now routinely available to the Office of the Secretary of Defense (OSD) and service managers and the application of this information to management issues.

Historically, the American armed forces have experienced periodic manpower shortages--quantitative, qualitative, or both (Griffith, 1979; Foner, 1970). Such shortages tend to intensify or recede as military requirements and civilian employment and wage alternatives fluctuate. For example, the services failed to meet their numeric and quality objectives in FY79; in contrast, the Air Force had filled 95 percent of its entire annual requirements only halfway through FY82.

The military services do not currently have recruiting problems. Recent recruiting successes partly reflect the current economic recession and the inordinate sensitivity of youth unemployment rates to economic cycles (Freeman, 1980). However, both the lessons of historical trends and the forecasts of demographers forewarn us that recruiting problems are bound to recur. This point is easily

quantified: Compared with 1979, the size of the prime age male cohort for recruiting (18 to 21 years) will shrink about 15 percent (or 1.2 million fewer individuals) by 1988, and about 25 percent (or 2 million individuals) by 1994.[1] If, in conjunction with this shrinkage, the national economy staged a major improvement, military recruiting problems would likely return. Although forecasts of the nation's economy are notoriously unreliable, the odds are low that military recruitment problems will not crop up at all during the 1980s. The only questions are "when?" and "how severe?" Given this prospect, manpower planners/managers need to base their responses to future shortages on a sophisticated understanding of the recruitment process and measures that monitor its performance.

Since the All Volunteer Force (AVF) was introduced in 1973, the military services have annually screened hundreds of thousands of applicants. In FY77 alone, 731,000 applicants took mental tests and recruiters contacted and held appointments with an even larger number. The very size of the services' recruiting activity means that even small improvements in its effectiveness and efficiency can yield large payoffs in the recruiting commands' ability to meet mission requirements and/or reduce their dollar costs.

To monitor the performance of the recruiting process, service and OSD managers need routine information on what happens in the process, to whom, and why. Although such information is collected and analyzed, it is not always available on a timely basis. Thus, the full potential of the military's applicant data systems cannot now be realized, although it could be with only small changes in what kinds of data are entered,

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[1] See Table 8, U.S. Bureau of the Census (1977).

how promptly, and in what form, and in the information processing technology (i.e., computer hardware and software) required to support these changes.

This report shows how these changes would let service and OSD managers monitor and manage the recruitment process more effectively as its parameters change--as they are sure to do--during the 1980s and 1990s. Specifically, we note possibilities for:

- Identifying the numbers and types of applicants being lost, and at which stages in the accession process.
- Identifying the numeric consequences of alternative enlistment standards.
- Identifying the likely accession payoffs from applicants with particular characteristics--information that has marketing implications.
- Profiling the socioeconomic and racial/ethnic characteristics of applicants in different sectors of a recruiting area. This information allows better targeted outreach.
- Monitoring how effective newly instituted enlistment incentives are in attracting high-quality applicants who formerly would not have enlisted.
- Pinpointing unusually strong (or weak) elements in the recruiting system: recruiters themselves, recruiting stations, recruiting areas, district recruiting commands, and service recruiting commands, using criteria other than merely "bottom line" measures (e.g., number and quality of accessions).

- o Monitoring applicants' progress through the accession process to flag and take action on those in a partially qualified status.
- o Substituting computer for paper files on an applicant.

II. DATA BASE AND VARIABLES

DATA BASE

The analysis reported here is based on the FY77 Applicant Cohort File, constructed for Rand by the Defense Manpower Data Center (DMDC) at Monterey, California. DMDC constructed this data base from information collected by the Armed Forces Examining and Entrance Station (AFEES)[1] Reporting System (ARS).

The Applicant Cohort File is a longitudinal register of a well-defined population of nonprior service applicants and their passage through stages of the recruitment process. The population consists of all male and female nonprior service (NPS) applicants to the active-duty forces of the Army, Navy, Air Force, or Marine Corps who had an ARS applicant record between October 1, 1976, and September 30, 1977, who had no qualification transactions[2] after FY77, and who did not enter the selected reserves[3] or officer corps. The sequence of the recruiting process is shown in Fig. 1. One part of the process can occur at any time and is omitted from Fig. 1--the application of service rules such as those about moral character and marital and dependency status.

The ARS records no information on the first two stages (recruiter contact and recruiter appointment). An ARS file on an applicant is

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[1] The AFEES is now called a Military Enlistment Processing Station (MEPS).

[2] A qualification transaction is any assessment of whether an applicant meets a service requirement. The major transactions of this kind are the mental, medical, and moral screens.

[3] The selected reserves include the Army Selected Reserve, Army National Guard, the Navy Reserve, the Marine Corps Reserve, the Air Force Reserve, and the Air National Guard.

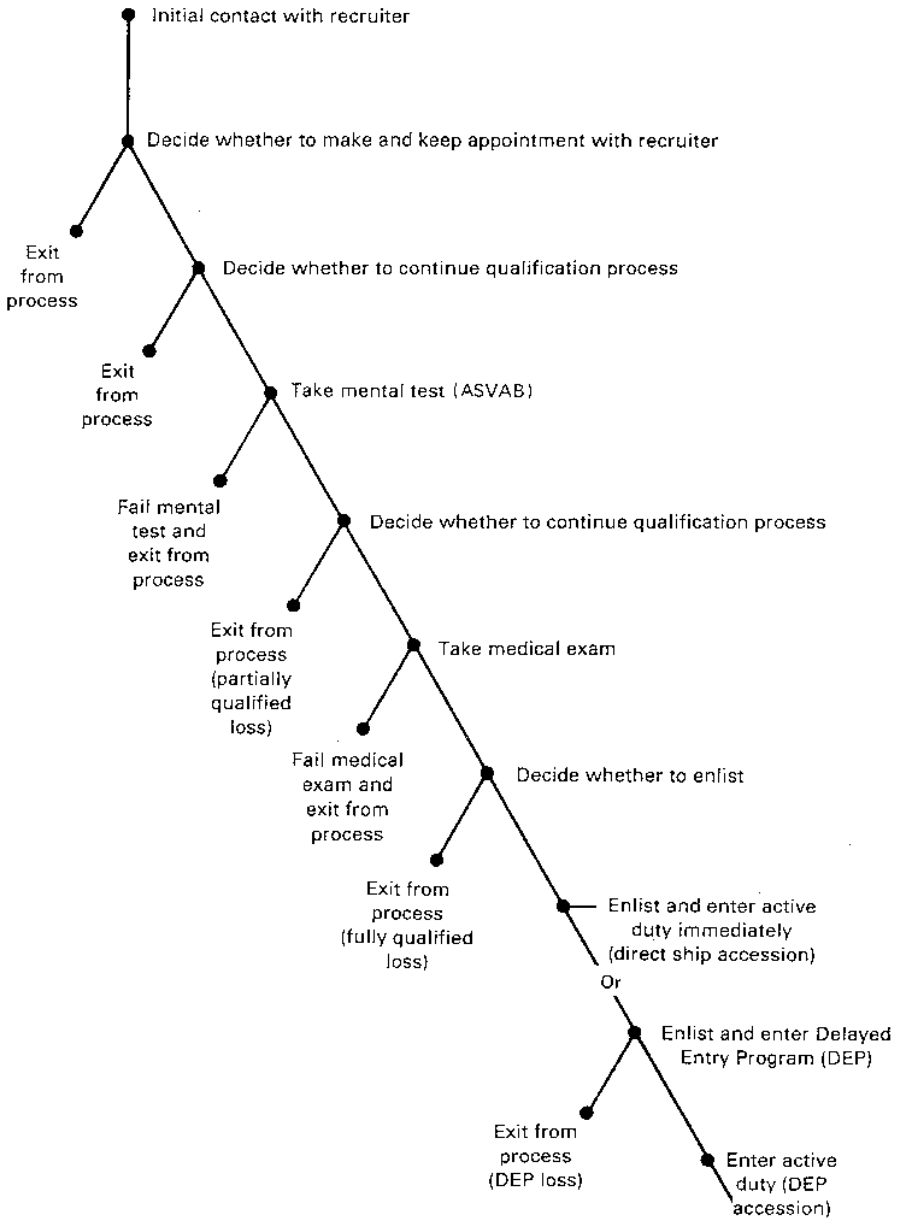

Fig. 1—Sequence of the recruiting process

created only when a prospective recruit either: (1) takes the production version[4] of the Armed Services Vocational Aptitude Battery (ASVAB), which is the mental test, or (2) having taken the ASVAB in high school, uses these scores to proceed directly to a medical examination at an AFEES.

DEFINITION OF RECRUITING STATUS

The Applicant Cohort File is longitudinal in that the DMDC also screened ARS files from October 1, 1977, through January 1979 to pick up subsequent recruiting transactions with the 1977 cohort. DMDC used the last recorded transactions on an applicant to define the applicant's recruiting status. That transaction may have occurred in FY77, FY78, or the first quarter of FY79. For example, an applicant who failed the medical examination in January 1977, but passed a second examination later in FY77 and qualified in all other ways would be defined as fully qualified. Using the longitudinal data on early applicants, DMDC eliminated from the file those who had qualification transactions with the military after FY77. As a result, all those classified as disqualified in the file were individuals who had made no later attempt to qualify. Those classified as partially qualified in the file were those who had made no later attempt to complete the qualification process. Thus, the file excludes those disqualified or partially disqualified in FY77 whose qualification status changed in FY78 or FY79.

[4] An individual can take the ASVAB in three different places: a high school, a Mobile Examining Team (MET) site, or the AFEES. ASVABs at the latter two sites are considered production ASVABs. The ARS does not include individuals who take the ASVAB in high school and do not have subsequent contact with an AFEES.

If a person fully qualified in FY77 had a Delayed Entry Program (DEP) enlistment, DEP loss, or accession transaction after FY77, DMDC used the last such record to define that person's final status and retained that individual in one file. Thus, a person fully qualified in FY77 who enlisted and accessed after FY77 is classified as an accession. A person enlisted in the DEP in FY77 who dropped out of the DEP after FY77 is counted as a DEP loss.

Appendix A describes in detail how DMDC constructed the FY77 Applicant Cohort File. Here we simply note that DMDC performed a number of checks and adjustments on the file that eliminated or substantially reduced the ARS data problems described in a recent Defense Audit Service report.[5] They checked the enlisted active-duty, selected reserve, and officer active duty files for individuals who (1) had enlisted in the active-duty services in FY77, but had no applicant record for FY76, the transition quarter, or FY77; (2) had applied to the active-duty enlisted force, but entered the selected reserves or officer corps; (3) applied in FY77, but had previously served in the active-duty forces; and (4) had enlisted in the active-duty forces, but were classified on the ARS as disqualified, partially qualified, or fully qualified and not enlisting.

After consulting with the U.S. Military Enlistment Processing Command (MEPCOM), the unit responsible for the ARS, DMDC concluded that those in the first category had tested and entered active duty on the same day. They created applicant records for these persons from their active-duty files. They eliminated from the file individuals in the

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[5] Defense Audit Service (1982).

second and third categories and corrected the final outcome of the applicant process for those in the fourth category. They also performed name and birthdate matches between the applicant, DEP, and accession records in FY77 to locate and eliminate duplicate records that had different social security numbers.

VARIABLES IN THE FY77 APPLICANT COHORT FILE

The recruiting process sequence (see Fig. 1) generates the outcomes defined in Table 1. These outcomes are the dependent variables examined in this analysis. One outcome--"Disqualified loss (all other reasons)"--can occur at any point in the process and is therefore not stage-specific. Appendix B is a technical discussion of the variables in Table 1.

These outcome variables measure the effects of enlistment standards and recruiting successes and failures at various stages. The three disqualification outcomes (outcomes 7-9) register the effects of enlistment standards. The two accession categories, direct ship and DEP (outcomes 1 and 2), measure recruiting successes. The fully qualified, partially qualified, and return to recruiter categories (outcomes 4-6) show recruiting failures.

The DEP loss category (outcome 3) confounds recruiting failures and the effects of enlistment standards. Some DEP losses were individuals who shunned active duty and were released from their contracts; others were individuals who no longer qualified for service.[6] Although the

[6] For example, if DEP enlistees get in trouble with the police, they risk moral disqualification. If they become pregnant or incur sports or accident-related injuries, they are medically disqualified. If high school seniors fail to graduate from high school and have AFQT scores that qualify them for enlistment only as high school graduates (but not as nongraduates), they become disqualified mentally.

Table 1

OUTCOMES OF THE FY77 APPLICANT PROCESS

Variable	Variable Definition
1. Direct accession	Fully qualified applicants who enlist and enter active duty immediately at enlistment.
2. DEP accession	Fully qualified applicants who enlist in the Delayed Entry Program (DEP) and enter active duty from the DEP.
3. DEP loss	Fully qualified applicants who enlist in the Delayed Entry Program (DEP) and are discharged from the DEP without entering active duty.
4. Fully qualified, not enlisted (QNE) loss	Fully qualified applicants who decline to enlist.
5. Partially qualified (PQ) loss	Applicants who meet service Armed Forces Qualification Test (AFQT) standards but fail to complete the qualification process.
6. Return to recruiter loss[a]	MEPCOM uses this code for applicants who lack administrative documents. The data indicate that they are partially qualified losses.
7. Mentally disqualified loss	Applicants whose AFQT scores fail to meet mental requirements for individuals of their sex and educational attainment. In FY77 the scores used to define a mental qualification or disqualification were miscalibrated.
8. Medically disqualified loss	Applicants who fail the military physical examination.
9. Disqualified loss, all other reasons[b]	Applicants who fail to meet other enlistment rules, such as those governing police records.

[a]This category does not appear in Fig. 1 as an outcome of the recruiting process. This category is discussed in the text and in App. B.

[b]This category is not stage-specific and therefore does not appear in Fig. 1.

ARS has a data field for a DEP discharge and its reasons, only DEP losses (but rarely the reasons) are recorded in this field, so we cannot differentiate a DEP "pushout" from a DEP dropout.[7]

Our analyses combine the "partially qualified loss" and "return to recruiter loss" categories into a single "partially qualified loss group." The distinction between the two appears to be more an artifact of ARS codes than a difference in applicant status (see App. B).

Those classified as mentally disqualified represent those whose AFQT scores fell below the cutoff required by the military service for that person's sex and educational attainment. Each service had different cutoffs for high school graduates and high school dropouts; most had different cutoffs for males and females.

Table 2 lists and defines the independent variables of the study, which are discussed in further detail in Sec. III and in App. B. Each variable was selected on one or more of the following grounds: (1) Could it predict (and potentially explain) an applicant's probability of accessing (e.g., age)? (2) Did it measure the social representativeness of active-duty applicants (e.g., minority status)? (3) Could it predict military job performance, first-term attrition, or first-term reenlistment (e.g., educational attainment)? or (4) Did it identify a unit with recruiting management responsibilities (AFEES)?

Section II describes what happened in the FY77 application process: how many were lost, when they were lost, and who they were. Section III

[7] Army Recruiting Command data for April 1981 show that 63 percent of male DEP losses and 59 percent of female DEP losses were disqualifications, not voluntary exits. However, we do not know if these rates can be generalized to FY77 and to all services.

Table 2

INDEPENDENT VARIABLES IN THE FY77 APPLICANT COHORT FILE

Variable	Variable Definition
SEX	
Male	
Female	
SERVICE	
DoD	
Army	
Navy	
Air Force	
Marines	
ARMED FORCES EXAMINING AND ENTRANCE STATION	
AGE	
RACE	
White	
Black	
Other	
ETHNICITY	
Hispanic	
Oriental	
Indian	
Filipino	
Other/None	
MINORITY	
Nonminority	Race = white or unknown. Ethnicity = other or none or unknown.
Minority	All other races and all other ethnicities.
EDUCATIONAL ATTAINMENT	
Nongraduate from high school	
High school graduate	
General Educational Development (GED) recipient	
One year of college	
Two years of college	
Three or four years of college, no diploma	
College graduate	
Master's degree or doctorate	

Table 2 (cont.)

Variable	Variable Definition
MARITAL AND DEPENDENCY STATUS	
Single, no dependents	
Single, ≥ 1 dependent	
Married, no dependent	
Married, 1 dependent	
Married, 2 dependents	
Married, 3 dependents	
Married, ≥ 4 dependents	
INCOME IN HOME OF RECORD CODE AREA	1976 average household income for the zip code of applicant's home of record.
TYPE OF AREA	
Large metropolitan area (core county)	County in which the central city of a large metropolitan area (1970 population of ≥ 1,000,000 residents) is located.
Large metropolitan area (suburban county or counties)	All other counties within a large metropolitan area.
Medium metropolitan area	Area of one or more counties and a total 1970 population of 250,000-999,999 residents.
Small metropolitan area	Area of one or more counties and a total 1970 population of 50,000-249,999 residents.
Urbanized adjacent non-metropolitan county	County with ≥ 20,000 urban residents[a]; county shares a common boundary with a metropolitan county.
Urbanized nonadjacent non-metropolitan county	County with ≥ 20,000 urban residents[a]; county does not share a common boundary with a metropolitan county.
Less urbanized, adjacent nonmetropolitan county	County with 2500-19,999 urban residents[a]; county shares a common boundary with a metropolitan county.
Less urbanized, nonadjacent nonmetropolitan county	County with 2500-19,999 urban residents[a]; county does not share a common boundary with a metropolitan county.
Rural, adjacent nonmetro-politan county	County with no urban residents[a]; county shares a common boundary with a metropol-itan county.

Table 2 (cont.)

Variable	Variable Definition
TYPE OF AREA (cont.)	
Rural, nonadjacent nonmetropolitan county	County with no urban residents[a]; county does not share a common boundary with a metropolitan county.
ECONOMIC SUBREGION	See 26 subregions in Fig. 2
MENTAL ABILITY (Misnormed)[b]	
Category I	Applicant's Armed Forces Qualification Test (AFQT) score = 93-99
Category II	Applicant's AFQT score = 65-92
Category IIIA	Applicant's AFQT score = 50-64
Category IIIB	Applicant's AFQT score = 31-49
Category IV	Applicant's AFQT score = 10-30
Category V	Applicant's AFQT score = 1-9
MENTAL ABILITY (Renormed)[b]	
Same categories as for misnormed mental ability variable	Same AFQT score definitions as for the misnormed mental ability categories.
APTITUDES	
Army aptitude variables	
Combat	AR + SP + SI + AD + CC[c]
Field artillery	AR + EI + CA + MK + GI
Electronics	AR + MD + EI + SI + CE
Operator and food	AI + CA + GI
General technical	WK + AR
Surveillance and communication	WK + AR + SP + MC
Mechanical maintenance	AI + EI + SI + MK + CM
Clerical	WK + AR + AD + CA
Skilled technical	AR + GS + MK
Marine Corps aptitude variables	
Same as the Army aptitude variables except:	
Electronics	AR + GS + EI + MK
Navy aptitude variables	
The Navy does not use composite aptitude variables. They use standard scores for the first 12 subtests defined in footnote c to this Table.	

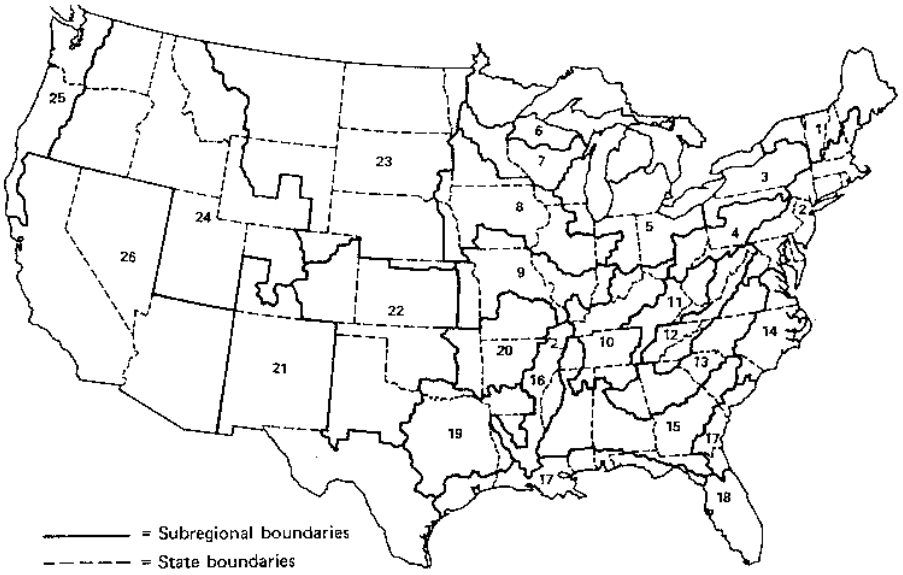
Table 2 (cont.)

Variable	Variable Definition
Air Force aptitude variables	
General	WK + AR
Mechanical	MC + AI + SI
Electronics	AR + SP + EI
Administrative	WK + AD + NO

[a]Residents are classified as urban if they live in an incorporated or unincorporated place or township of 2500 or more inhabitants.

[b]The distinction between misnormed and renormed mental ability scores is defined in App. B.

[c]GI = General information
NO = Numerical operations
AD = Attention to detail
WK = Word knowledge
AR = Arithmetic reasoning
SP = Space perception
MK = Math knowledge
EI = Electronic information
MC = Mechanical comprehension
GS = General science
SI = Shop information
AI = Automotive information
CM = Maintenance
CA = Attentiveness
CE = Electronics
CO = Combat



1. Northern New England - St. Lawrence
2. Northeastern Metropolitan Belt
3. Mohawk Valley and New York - Pennsylvania Border
4. North Appalachian Coal Fields
5. Lower Great Lakes Industrial
6. Upper Great Lakes
7. Dairy Belt
8. Central Corn Belt
9. Southern Corn Belt
10. Southern Interior Uplands
11. Southern Appalachian Coal Fields
12. Blue Ridge, Great Smokies, and Great Valley
13. Southern Piedmont
14. Coastal Plain Tobacco and Peanut Belt
15. Old Coastal Plain Cotton Belt
16. Mississippi Delta
17. Gulf of Mexico and South Atlantic Coast
18. Florida Peninsula
19. East Texas and Adjoining Coastal Plain
20. Ozark - Ouachita Uplands
21. Rio Grande
22. Southern Great Plains
23. Northern Great Plains
24. Rocky Mountains, Mormon Valleys, and Columbia Basin
25. Northern Pacific Coast (including Alaska)
26. The Southwest (including Hawaii)

Fig. 2 — Economic subregions of the United States

SOURCE: U.S. Department of Agriculture

considers how the services might reduce these losses by examining similarities and differences between those who access and those who exit from the recruiting process. Section IV discusses how the services might increase their use of applicant data for management purposes, and the data and technology changes necessary to do so.

III. DYNAMICS OF THE RECRUITING PROCESS

This section examines the recruiting process during a single year (FY77) to ascertain how many applicants were lost, when in the process they were lost, and what characteristics they had. The description here is an example of the management information contained in applicant data. It also furnishes clues (which will be followed up in Sec. III) as to why some applicants exited from the process despite their having qualified for service.

WHAT HAPPENS AND WHEN?

One key management question is: How many applicants are lost from the applicant pool, and at what stages in the process? Figure 3 provides an overview of applicant outcomes, by source. The FY77 applicants are distributed among three basic outcomes: disqualification, partial qualification without completion of the qualification process or full qualification without accession,[1] and accession.[2] In FY77, DoD accessed 51 percent of all applicants who

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[1] In Fig. 3 and Tables 3 through 5, we treat DEP losses as voluntary failures to access, not as disqualifications. As noted earlier, an unknown percent of DEP losses are applicants disqualified after DEP entry. However, the number of DEP losses is very small. Even if we assume that 50 percent of DEP losses are disqualified, rather than fully qualified, applicants, the shift in absolute numbers and percentages in Fig. 3 would be very small. As a percentage of all applicants, the disqualified losses would increase by less than 1 percent to 21.4 percent and the partially or fully qualified losses would decline by less than 1 percent to 27.5 percent.

[2] Figure 3 and Tables 3 through 5 adjust the fully and partially qualified numbers to take account of MEPCOM's February 1977 change in outcome codes. Appendix B discusses this change and its implications for the fully qualified, partially qualified, and return to recruiter categories. To estimate the proportion of applicants in each of these categories for the full fiscal year, we assumed that the monthly average for each of these categories from February to September 1977 could be generalized to the first four months of FY77.

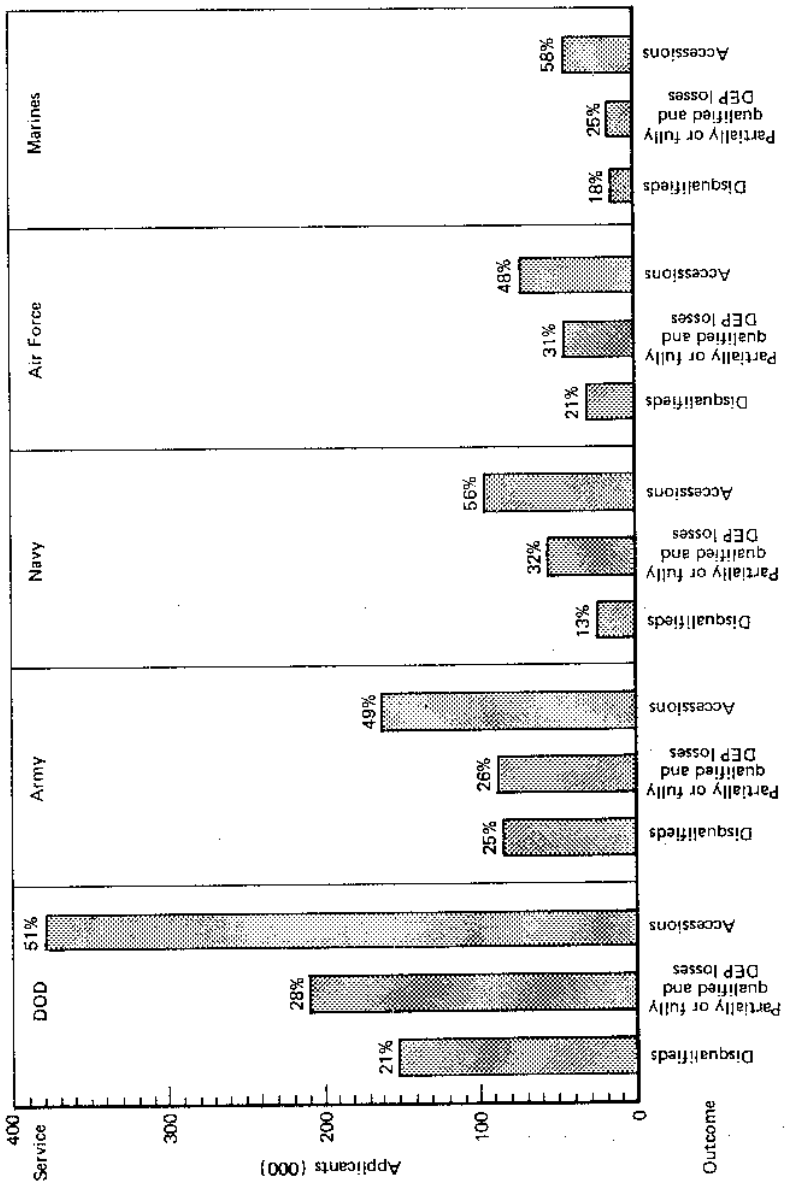

Fig. 3 – FY77 applicant outcomes by service

entered the test process. They rejected another 21 percent and failed to access 28 percent of the partially or fully qualified applicants in the pool.

Further detail on these three outcomes is given in Table 3. AFQT failures accounted for 79 percent of all disqualifications and medical examination failures for another 20 percent. Once AFEES processing was initiated, other disqualifications were trivial--two-tenths of a percent of all applicants and seven-tenths of a percent of all disqualifications.

The largest single source of applicant loss was the partially qualified (PQ) category, a group largely ignored by OSD and the services. These persons met service AFQT standards but failed to complete the qualification process. In FY77 there were 179,000 PQ losses, representing a quarter of all FY77 applicants and 29 percent of all FY77 mentally qualified applicants. This is clearly an important potential source of further accessions.

The fully qualified, not enlisted (QNE) and DEP losses were very small by comparison. Together they represent less than a sixth of the PQ losses, only 3.9 percent of the total applicant pool, 5 percent of all mentally qualified applicants, and 7 percent of all fully qualified applicants.

Tables 4 and 5 show these same data separately for males and females. Compared with the initial pool, all services access twice as many male as female applicants. The differences by sex are primarily attributable to differences in AFQT failure rates and PQ loss rates. The differences in AFQT failure rates reflect the different AFQT

Table 3

FY77 APPLICANT OUTCOMES BY SERVICE

Outcome	DoD		Army		Navy		Air Force		Marines	
	N	%	N	%	N	%	N	%	N	%
	Service									
Total disqualified losses	149,704	20.5	82,221	24.9	22,481	12.8	31,302	21.0	13,700	17.9
Mentally disqualified	118,471	16.2	66,915	20.3	14,053	8.0	27,238	18.3	10,265	13.4
Medically disqualified	30,132	4.1	14,620	4.4	8,301	4.7	3,932	2.6	3,279	4.3
Other disqualified[a]	1,101	0.2	686	0.2	127	0.1	132	0.1	156	0.2
Total partially or fully qualified losses	207,481	28.4	86,937	26.3	55,458	31.7	46,161	31.0	18,925	24.7
Partially qualified[b]	179,129	24.5	73,913	22.4	48,026	27.4	41,645	27.9	15,450	19.7
Fully qualified[c] (not enlist)	15,146	2.1	7,008	2.1	4,927	2.8	2,028	1.4	1,278	1.7
DEP losses (enlist/not access)	13,206	1.8	6,016	1.8	2,505	1.4	2,488	1.7	2,197	2.9
Total accessions	374,304	51.2	161,176	48.8	97,232	55.5	71,769	48.1	44,127	57.5
Direct ship accessions	74,206	10.2	23,524	7.1	31,305	17.9	11,366	7.6	8,011	10.4
DEP accessions	300,098	41.0	137,652	41.7	65,927	37.7	60,403	40.5	36,116	47.1
Total	731,489	100.0	330,334	100.0	175,171	100.0	149,232	100.0	76,752	100.0

Note: N = number of applicants.

[a]Other disqualifications are primarily on moral grounds.

[b]Partially qualified losses combine the partially qualified and return to recruiter categories. Numbers for the full fiscal year represent the sum of the numbers for February-September 1977 and an extrapolation of the monthly averages of these to October 1976 through January 1977.

[c]The number of fully qualified losses for the entire fiscal year represents the sum of the number of fully qualified losses for February through September 1977 and an extrapolation of the monthly average of these losses to October 1976 through January 1977.

Table 4

FY77 MALE APPLICANT OUTCOMES BY SERVICE

Outcome	Service									
	DoD		Army		Navy		Air Force		Marines	
	N	%	N	%	N	%	N	%	N	%
Total disqualified losses	113,864	18.4	63,942	22.8	19,332	12.3	18,527	16.7	12,063	16.7
Mentally disqualified	87,015	14.0	50,962	18.2	11,986	7.5	15,371	13.9	8,786	12.2
Medically disqualified	25,942	4.2	12,427	4.4	7,340	4.7	3,047	2.8	3,128	4.3
Other disqualified[a]	907	0.2	553	0.2	96	0.1	109	0.1	149	0.2
Total partially or fully qualified losses	138,757	22.4	57,721	20.6	39,515	25.0	27,382	24.8	14,117	19.6
Partially qualified[b]	162,835	26.2	68,696	24.5	46,059	29.2	30,687	27.7	17,393	24.0
Fully qualified[c] (not enlist)	13,207	2.1	6,113	2.2	4,385	2.8	1,507	1.4	1,224	1.7
DEP losses (enlist/not access)	10,871	1.8	4,862	1.7	2,159	1.4	1,798	1.6	2,052	2.9
Total accessions	343,989	55.4	147,506	52.7	92,392	58.6	61,430	55.5	42,061	59.2
Direct ship accessions	70,152	11.3	22,272	8.0	30,366	19.3	9,700	8.8	7,814	10.8
DEP accessions	273,837	44.1	125,234	44.7	62,026	39.3	51,730	46.8	34,847	48.3
Total	620,688	100.0	280,144	100.0	157,783	100.0	110,644	100.0	72,117	100.0

Note: N = number of applicants.

[a]Other disqualifications are primarily on moral grounds.

[b]Partially qualified losses combine the partially qualified and return to recruiter categories. Numbers for the full fiscal year represent the sum of the numbers for February-September 1977 and an extrapolation of the monthly averages of these to October 1976 through January 1977.

[c]The number of fully qualified losses for the entire fiscal year represents the sum of the number of fully qualified losses for February through September 1977 and an extrapolation of the monthly average of these losses to October 1976 through January 1977.

Table 5

FY77 FEMALE APPLICANT OUTCOMES BY SERVICE

Outcome	Service									
	DoD		Army		Navy		Air Force		Marines	
	N	%	N	%	N	%	N	%	N	%
Total disqualified losses	35,840	32.4	18,279	36.4	3,149	18.1	12,775	33.1	1,637	35.3
Mentally disqualified	31,456	28.4	15,953	31.8	2,157	12.4	11,867	30.8	1,479	31.9
Medically disqualified	4,190	3.8	2,193	4.4	961	5.5	885	2.3	151	3.3
Other disqualified[a]	194	0.2	133	0.3	31	0.2	23	0.1	7	0.2
Total partially or fully qualified losses	40,269	36.4	16,162	32.2	8,511	49.0	14,263	37.0	1,333	28.8
Partially qualified[b]	44,646	40.3	18,241	36.3	9,399	54.1	15,474	40.1	1,532	33.1
Fully qualified[c] (not enlist)	2,042	1.8	925	1.8	542	3.1	521	1.4	54	1.2
DEP losses (enlist/not access)	2,335	2.1	1,154	2.3	346	2.0	690	1.8	145	3.1
Total accessions	30,315	27.4	13,670	27.2	4,840	27.8	10,339	26.8	1,466	31.6
Direct ship accessions	4,054	3.7	1,252	2.5	939	5.4	1,666	4.3	197	4.3
DEP accessions	26,261	23.7	12,418	24.7	3,901	22.4	8,673	22.5	1,269	27.4
Total	110,801	100.0	50,190	100.0	17,388	100.0	38,588	100.0	4,635	100.0

Note: N = number of applicants.

[a]Other disqualifications are primarily on moral grounds.

[b]Partially qualified losses combine the partially qualified and return to recruiter categories. Numbers for the full fiscal year represent the sum of the numbers for February-September 1977 and an extrapolation of the monthly averages of these to October 1976 through January 1977.

[c]The number of fully qualified losses for the entire fiscal year represents the sum of the number of fully qualified losses for February through September 1977 and an extrapolation of the monthly average of these losses to October 1976 through January 1977.

standards that were in effect for male and female applicants in FY77.

Figure 4 portrays the DoD accession process, showing outcomes at each stage. The proportions at each juncture refer to those still in the recruiting process at that point. For example, whereas Table 3 showed that 4 percent of all DoD applicants failed the medical examination, Fig. 4 shows that of those who reached the point of taking it, 7 percent failed. The data in Fig. 4 show two important points: (1) the services incurred their highest proportionate losses at the point of the AFQT test, either in the form of AFQT failures or AFQT passes who then exited from the recruiting process; and (2) the services lost a larger percent of women than of men at every exit point in the process.

We do not yet know whether the distribution of FY77 applicants among recruiting outcomes is typical of recent experience or is peculiar to that fiscal year. Calculations for applicants in April 1981 and for applicants in FY81 indicate distributions for these years similar to the FY77 distribution.[3] This similarity of distributions for the two, however, does not mean that the supply and demand factors underlying the two observed distributions are necessarily the same. For example, on the demand side the military services adjust their enlistment standards up or down, depending on such considerations as the supply of applicants.

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[3] The Rand sample for the Educational Benefits Test and ARS data for FY81 applicants were the sources of these calculations. However, in several ways these FY81 data bases are not comparable to the FY77 Applicant Cohort File. DMDC is now constructing a FY80 applicant cohort file comparable to the FY77 file. This data base will represent the first valid basis for comparing recruiting process outcomes over time.

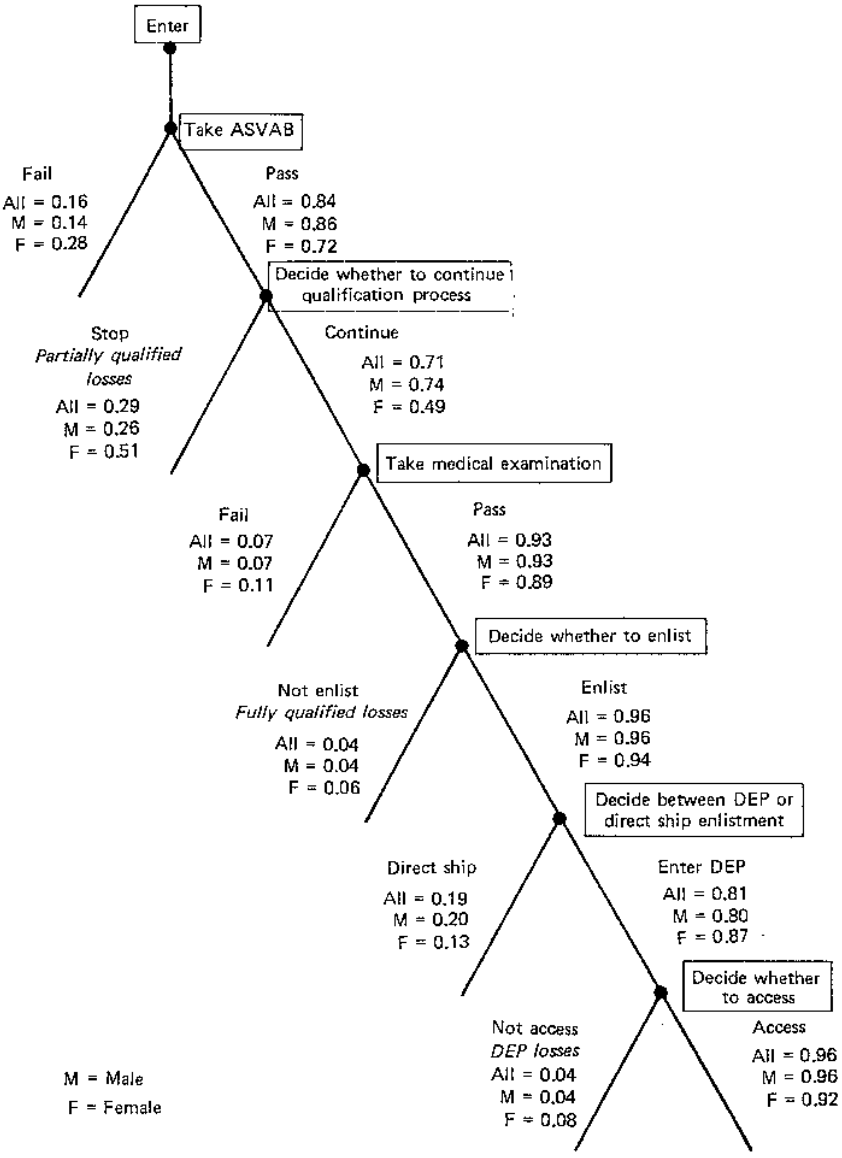

Fig. 4 — Outcome probabilities at each stage of DoD accession process for FY77 male and female applicants

WHO FAILS TO ACCESS?

We have examined the FY77 applicant cohort's distribution across outcomes, identifying those points in the application sequence where a disproportionately large fraction of applicants were lost. We next identify eight different applicant characteristics found to affect recruiting outcomes. Tables A.1 and A.2 (App. A) present a statistical profile of each outcome group. The central question addressed in this analysis is: What characteristics predispose accession and hence have possible recruiting payoffs?

Consequences of Applicant Characteristics for Accessions

To identify characteristics having high and low recruiting payoffs, we estimated the probability that a particular characteristic will result in an accession. Characteristics considered were race and ethnicity, age, educational attainment, AFQT category,[4] average household income of zip code of home of record, marital and dependency status, type of area, and economic subregion.

The following data (and, in most cases, related discussion) are restricted to all males, regardless of service. The rank order of loss at each stage of the process did not vary by service, regardless of which characteristic we examined; nor did it vary by gender, except for educational attainment, AFQT category, and marital and dependency status.[5]

[4] AFQT category is based on FY77 norms, i.e., on miscalibrated AFQT scores. See App. B and later in this section for further discussion of this point.

[5] In FY77 some services had different educational and AFQT requirements for women and men, which explain the first two exceptions.

There are two tables for each characteristic. The first shows the distribution of the applicant cohort among the recruiting outcomes by categories of the characteristic.[6] It also shows how numerically important a category of a characteristic is to the services and how the composition of the accession group differs from that of the initial applicant pool for that category.

The second table shows PQ losses and QNE losses[7] as percentages of those mentally qualified and fully qualified, respectively.[8] Thus, in the PQ case it corrects for differences among categories in AFQT failures. In the QNE case it corrects for differences among categories in AFQT failures, PQ losses, and medical failures.

The characteristics had certain common effects, summarized as follows:

1. The major losses are invariably concentrated in the AFQT failure category and PQ category, irrespective of applicant characteristic.
2. AFQT failure rates, PQ loss rates, and QNE loss rates typically vary among the different segments of the applicant population.
3. Variations in medical failure rates are age-related. For example, applicants with at least some college had higher medical failure rates than applicants with less education, because the former are, on average, older.

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[6] These tables ignore the outcome group that was disqualified for other reasons. As Table 3 showed, this group represented only two-tenths of a percent of all applicants.

[7] DEP losses vary little by values of a characteristic and, except for one case, these losses are not reported in the second table.

[8] The data reported in this second table are calculated in the same way as those for Fig. 4.

4. DEP loss rates showed little variation by applicant characteristics, even when variations in losses prior to DEP enlistment had been eliminated.
5. If characteristics of applicants did not mirror the distribution of these characteristics in the total youth population, their unrepresentativeness was primarily attributable to that of the initial applicant pool, not to unrepresentative exits from that pool. The recruiting process generally operated to increase, not decrease, representativeness.

Race and ethnicity. Outcomes are closely associated with the applicant's race and ethnicity, with black and Hispanic applicants having triple the AFQT failure rates of white applicants (Table 6). These racial and ethnic differences undoubtedly reflect differences in educational attainment and interactions between such differences and the AFQT standards applied by each service.[9] They also probably reflect racial and ethnic differences in the AFQT score distributions of the youth population. In FY77 AFQT categories IV and V accounted for almost all of the AFQT failures. Recent data on the AFQT scores of the 18 to 23 year old youth population show Hispanic youth 2.7 times the percentage of white youth in AFQT categories IV and V; black youth, 3.3 times the white percentage.[10]

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[9] FY77 AFQT standards varied by educational attainment and service--for example, standards were higher for high school dropouts than for graduates.

[10] See Table 10, U.S. Department of Defense (1982).

Table 6

FY77 APPLICANT OUTCOMES BY RACE AND ETHNICITY
(DoD Males)

Race and Ethnicity	Number of Applicants	Loss by Stage of Accession Process (Percent)						Percent Access	Percent of Applicants	Percent of Accessions
		Total Loss	Fail AFQT	Fail to Take Medical Exam	Fail Medical Exam	Fail to Enlist	Fail to Access			
White	452,405	42.6	9.2	22.7	4.6	4.2	1.8	57.4	72.9	75.5
Black	145,318	50.3	28.3	14.6	3.1	2.6	1.5	49.7	23.4	21.0
Hispanic	14,532	53.1	29.6	17.0	2.2	2.4	1.8	46.9	2.3	2.0
Other	8,636	39.6	15.5	15.3	4.0	2.8	1.8	60.4	1.4	1.5

Table 6 also shows that the final accession group had a somewhat higher proportion of whites than the initial applicant pool.

The data in Table 7 afford comparisons of "at risk" groups at two stages in the process. The percentages in each column represent the fraction of those remaining in the applicant pool at that point. The table shows that of those mentally qualified, whites and Hispanics had higher PQ loss rates than blacks and other ethnicities.[11] Of those fully qualified, whites had the highest, but not a substantially higher, QNE loss rate.

The DoD document, Profile of American Youth, notes the concern that the enlisted ranks should be "representative" of American youth.[12]

Table 7

FY77 APPLICANT COHORT: LOSS AS A PERCENTAGE OF THOSE REMAINING IN POOL BY RACE AND ETHNICITY (DoD Males)

Race and Ethnicity	PQ Loss as Percent of All Those Mentally Qualified	QNE Loss as Percent of All Those Fully Qualified
White	25.0	6.7
Black	20.4	4.8
Hispanic	24.1	4.8
Other	18.1	4.3

[11] The other ethnicity category consists of applicants of Oriental, American Indian, and Filipino extraction.

[12] U.S. Department of Defense (1982), p. 21. This concern is most evident in the civilian society, reflecting in part historical preferences for a "citizen army" (see, for example, Prucha (1969)).

Dimensions of representativeness include verbal and mathematical abilities ("quality"), race and ethnicity, and the socioeconomic status of enlistees' families.[13] As Table 8 shows, the FY77 applicant pool and accessions were not representative of the racial and ethnic distribution of the 18 to 24 year old youth population. Compared with

Table 8

RACIAL AND ETHNIC REPRESENTATIVENESS OF F77
DoD MALE APPLICANTS AND ACCESSIONS
(Percent)

Population	Total	White	Black	Hispanic	Other
18 to 24 year old population (1978)[a]	100	80	12	6	2
FY77 DoD male applicants[b]	100	73	23	2	1
FY77 DoD male accessions[b]	100	76	21	2	2

[a]From Table 15, Bureau of the Census (1979). The data appear as total, white, black, and Hispanic, where Hispanics can be of either race. The total sums to more than the white and black groups combined, indicating a residual category, or other ethnicities. To determine the the percentage of white non-Hispanics, black non-Hispanics, Hispanics, and non-Hispanic others, we used 1970 estimates of the distribution of Hispanics among white, black, and other races.

[b]From Table 6, text.

[13] As Profile of American Youth observes, quality has recently dominated the representativeness concerns.

their percentages in the civilian population, whites and Hispanics were underrepresented and blacks substantially overrepresented in both the FY77 applicant and accession groups. The recruiting process increased racial and ethnic representativeness somewhat, but the racial and ethnic disproportions in the initial applicant pool primarily determined the proportions of the final accession group.

Age. Age has an orderly relationship with all outcomes except AFQT failures and DEP losses. As Table 9 shows, PQ losses, medical failures, and QNE losses systematically increased with age. Thus, the final accession group was somewhat skewed toward 16 to 18 year olds relative to those initially applying. Since AFQT failures did not vary by age, the positive relationship between age and PQ losses remained even when we calculated PQ losses as a percentage of the mentally qualified (see Table 10). The positive relationship between age and QNE losses also remained even when age-related differences in PQ losses and medical failures were eliminated.

Educational attainment. In interpreting the educational attainment data, two points should be kept in mind. First, an AFQT failure is an applicant who fails to meet the service's minimum AFQT standards for the applicant's sex and educational status. As noted in Sec. I, the services required a higher AFQT score for high school dropouts than for graduates. Thus, even if nongraduate and graduate applicants have the same AFQT distributions, we would expect higher AFQT failure rates among nongraduates than among graduates.

Second, as App. B discusses, in FY77 the ARS coded both high school dropouts and seniors as nongraduates, thereby confounding two very

Table 9

FY77 APPLICANT OUTCOMES BY AGE
(DoD Males)

Age (years)	Loss by Stage of Recruiting Process (Percent)						Total Accessions (Percent)	Percent of Applicants	Percent of Accessions	Number of Applicants
	AFQT Failure	PQ Loss	Medical Failure	QNE Loss	DEP Loss	Total Losses				
16-18	12.9	17.5	3.3	2.8	2.0	38.6	61.4	54.7	60.5	339,175
19-21	16.2	20.4	4.6	4.0	1.4	46.8	53.2	30.2	28.9	186,957
22-24	14.3	29.7	5.6	6.2	1.4	57.5	42.5	9.8	7.5	60,611
25-29	13.1	36.3	7.2	8.3	1.3	66.4	33.6	4.4	2.7	27,492
30-39	12.9	42.6	9.2	10.7	1.3	76.8	23.2	0.9	0.4	5,568

Table 10

FY77 APPLICANT COHORT: LOSS AS A PERCENTAGE OF THOSE REMAINING IN POOL BY AGE (DoD Males)

Age (years)	PQ Loss as Percent of All Those Mentally Qualified	QNE Loss as Percent of All Those Fully Qualified
16-18	20.1	6.7
19-21	24.4	6.7
22-24	34.7	12.3
25-29	41.7	19.1
30-39	48.9	30.3

different populations: persons with uncertain prospects of completion and persons virtually sure to finish.

As Table 11 shows, the educational attainment variable bears a curvilinear relationship to accessions. GED and high school graduates had the highest accession rates; high school nongraduates, a lower rate; and those with at least one year of college, the lowest rate. Thus, the final accession group had an educational distribution more peaked around the high school graduate category than the initial applicant pool.

Two factors were primarily responsible for the observed curvilinearity. First, as anticipated, high school nongraduates failed to meet AFQT standards at much higher rates than members of any other educational category. Second, having even one year of college substantially increased the PQ and QNE loss rates.

Table 11

FY77 APPLICANT OUTCOMES BY EDUCATIONAL ATTAINMENT
(DoD Males)

Educational Attainment	Loss by Stage of Recruiting Process (Percent)						Total Accessions (Percent)	Percent of Applicants	Percent of Accessions	Number of Applicants
	AFQT Failure	PQ Loss	Medical Failure	QNE Loss	DEP Loss	Total Losses				
High school nongraduates[a]	25.8	21.4	4.0	3.4	1.9	56.7	43.4	35.7	27.9	221,104
GED	6.2	19.5	4.3	4.2	1.7	36.1	63.9	2.9	3.4	18,160
High school graduate	8.0	17.5	3.8	3.4	1.7	34.4	65.6	54.8	64.8	340,025
1 year college	6.0	42.3	8.1	8.0	2.0	66.5	33.5	2.2	1.3	13,481
2 years college	4.5	40.9	7.3	7.9	1.6	62.4	37.6	1.8	1.2	10,820
3-4 years college	3.5	48.6	0.4	9.7	1.6	73.9	26.1	0.8	0.4	4,794
≥ college graduate	1.7	45.3	9.5	12.3	0.9	69.8	30.2	1.9	1.0	11,866

[a]High school nongraduates include high school seniors and dropouts.

When the PQ and QNE loss rates are expressed as percentages of those mentally qualified and fully qualified, respectively, the educational attainment effect becomes more dramatic (Table 12). These data also show that high school nongraduates had a noticeably higher PQ loss rate than graduates when these losses are calculated as a percentage of the mentally qualified. This finding seems counterintuitive, since the nongraduates include high school dropouts,

Table 12

FY77 APPLICANT COHORT: LOSS AS A PERCENTAGE OF THOSE REMAINING IN POOL BY EDUCATIONAL ATTAINMENT (DoD Males)

Educational Attainment	PQ Loss as Percent of All Those Mentally Qualified	QNE Loss as Percent of All Those Fully Qualified	DEP Loss as Percent of Enlistments
High school nongraduate[a]	28.9	7.0	4.1
GED	20.8	6.0	2.6
High school graduate	19.0	4.7	2.5
1 year college	45.0	18.2	5.6
2 years college	42.8	16.8	4.1
3-4 years college	50.4	25.8	5.6
≥ college graduate	46.1	28.3	2.9

[a]In FY77 the ARS did not distinguish high school seniors from dropouts and the nongraduate group includes both types of applicants.

who are known to have higher unemployment rates[14] and fewer educational opportunities than graduates. These data may reflect two processes. First, the nongraduate group includes some high school seniors who are nearing graduation--a group possibly more inclined toward "shopping around," and therefore more apt to leave the recruiting process than high school graduates who are more committed to the job search.

Second, in FY77 all services allowed male high school dropouts to enlist if they met service AFQT and other standards. The services, however, sought to achieve a particular enlistment mix of high school graduates and dropouts, with a high ratio of graduates to dropouts. These objectives varied among services and, within service, by recruiting area and sometimes by time of year. Thus, although no service excluded male dropouts regardless of their other qualifications, they pursued certain objectives that may well have introduced a selectivity bias favoring high school graduates. In response to these objectives, recruiters may have made extra efforts to retain graduates in the recruiting process. The result would be higher PQ loss rates for the dropouts.

Data on nongraduate PQ loss rates by service are consistent with this interpretation. Traditionally, the Air Force can afford more selective recruiting than the other services, and we find that its PQ loss rate for mentally qualified nongraduates is 1.5 to 2 times higher than those for the other services.

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[14] See Table 67, U.S. Department of Labor (1980).

Although service preferences for high school graduates over dropouts probably accounts for some nongraduate PQ losses, it is noteworthy nevertheless that in FY77 80,878 or 63 percent of DoD's male PQ losses had at least a high school diploma.

Table 12 also reveals a curious pattern of PQ, QNE, and DEP losses for those with at least some college. We might expect at least the PQ and QNE loss rates to increase with each additional year of college. However, although the differences are not large, the loss rates for each of these three recruiting outcomes are systematically higher for those with one year of college than for those with two years. The PQ and DEP loss rates are somewhat higher for those with three to four years of college than for those with college degrees. Completion of two years of college and four years of college are recognized termination points in the postsecondary educational process. The slightly higher applicant attrition observed for those who have some postsecondary education but not a two or four year college degree may reflect postsecondary completion pressures on these individuals.

In terms of educational attainment, neither the initial pool nor the final accession group was representative of male 18 to 24 year olds (Table 13). In the applicant pool high school nongraduates and graduates were overrepresented; those with some college or a college degree, underrepresented. In terms of accessions, the recruiting process reduced the overrepresentation of high school nongraduates, increasing it for high school graduates, and increasing the underrepresentation of those with some college or a college degree.

Table 13

EDUCATIONAL REPRESENTATIVENESS OF FY77
MALE APPLICANTS AND ACCESSIONS

Educational Attainment	18 to 24 Year Old Male Youth (1978)[a]	FY77 DoD Male Applicants[b]	FY77 DoD Male Accessions[b]
High school nongraduates	24.5	36	28
High school graduates	43.7	36	65
1-3 years of college	25.5	5	3
College degree	6.4	2	1

[a]From Table 1, U.S. Bureau of the Census (1980).

[b]From Table 11, text.

These numbers show that accessions from the FY77 applicant cohort were educationally unrepresentative primarily because of the unrepresentativeness of the applicant pool, not because of unrepresentative losses from that pool. To change the educational profile of AVF accessions in FY77, the services would have had to change the profile of AVF applicants.

AFQT category. As noted in Sec. I, in FY77 the services classified applicants as AFQT failures or passes on the basis of miscalibrated AFQT scores. Since we wanted to describe actual outcomes of the FY77 recruiting process, we had to use FY77 AFQT qualification decisions based on miscalibrated scores.[15]

[15] The miscalibration inflated AFQT scores, with the result that a sizable number of category IV applicants were categorized as category III. This misnorming affects recruiting outcomes in two ways. Compared

Here we are interested in how AFQT variations among those who passed the AFQT affected recruiting outcomes. Table 14 shows that accession rates increased from AFQT category I to IIIB as the result of small, but steady, decreases in PQ and QNE loss rates. These effects of AFQT category were not great, but they were systematic. Also, in FY77 69,659, or 69 percent, of the PQ losses had AFQT scores in categories I through IIIA; 108,447, or 91 percent, AFQT scores in categories I through IIIB.

Table 15 presents the PQ loss rates as a percentage of those mentally qualified and QNE rates as a percentage of those fully qualified. We would expect AFQT category IV applicants who had met AFQT standards to have the lowest PQ loss rate of the category I to IV groups because their educational and employment options are more limited than those of applicants with higher AFQT scores. In fact, they have the highest. This finding, like the previous one for high school nongraduates, may reflect the selectivity bias of recruiters toward high school graduates. DoD data indicate that high school nongraduates score disproportionately in the lower AFQT categories.[16] As noted earlier, in FY77 the services wanted a high ratio of high school graduates to

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with a properly calibrated test, a higher percentage would be certified as having met AFQT standards. Second, there should be a downward bias in the PQ and QNE loss rates at each miscalibrated AFQT level. Individuals with lower verbal and quantitative achievements have fewer educational and employment options than those with higher achievements. If the AFQT measures these achievements reasonably well, people with lower AFQT scores should be more willing to stay in the recruiting process than ones with higher scores. PQ and QNE loss rates should be lower at each upwardly biased AFQT level than under properly normed AFQT levels.

[16] See Table C-2, U.S. Department of Defense (1982).

Table 14

FY77 APPLICANT OUTCOMES BY MENTAL ABILITY
(DoD Males)

AFQT Category[a]	Loss by Stage of Recruiting Process (Percent)						Total Accessions (Percent)	Percent of Applicants	Percent of Accessions	Number of Applicants
	AFQT Failure	PQ Loss	Medical Failure	QNE Loss	DEP Loss	Total Losses				
I	0.0	28.6	4.0	4.7	1.9	39.3	60.7	4.4	4.8	27,165
II	0.0	24.6	3.6	4.1	2.1	34.7	65.4	21.5	25.4	133,500
IIIA	0.0	21.8	3.5	3.4	2.1	31.8	68.3	21.5	26.4	133,252
IIIB	4.5	20.3	3.5	3.1	2.0	33.7	66.3[b]	30.8	36.8	191,074
IV	56.0	14.4	1.5	1.5	1.0	74.4	25.6[c]	12.7	5.9	79,069
V	100.0	0.0	0.0	0.0	0.0	100.0	0.0	5.6	0.0	34,618

[a]AFQT categorization of applicants is based on misnormed AFQT scores.

[b]Of those in category IIIB who passed the ASVAB, the percentage who accessed was 69.5.

[c]Of those in category IV who passed the ASVAB, the percentage who accessed was 58.1.

Table 15

FY77 APPLICANT COHORT: LOSS AS A PERCENTAGE OF THOSE REMAINING IN POOL BY MENTAL ABILITY[a] (DoD Males)

AFQT Category	PQ Loss as Percent of All Those Mentally Qualified	QNE Loss as Percent of All Those Fully Qualified
I	28.6	7.0
II	24.6	5.7
IIIA	21.8	4.6
IIIB	21.3	4.3
IV	32.7	5.3

[a]The AFQT categorization of applicants was based on miscalibrated AFQT scores.

dropout enlistments. We would expect recruiters to respond to these objectives by trying harder to keep graduates in the recruiting process than dropouts. If this occurred, the association between lower AFQT scores and dropout status would show up as higher PQ loss rates for category IV applicants.[17]

Finally, we can assess the representativeness of the mean AFQT scores of FY77 male applicants and accessions, relative to 1980 male youth. Table 16 shows properly calibrated (as well as miscalibrated) scores. It shows that the recruiting process produced an accession

[17] We cannot assess this argument with this data base because the FY77 ARS nongraduate code did not distinguish high school seniors from dropouts.

group with a mean AFQT score 5 points higher than that of the initial applicant group and 2.5 points lower than that of males 18 to 23 years old in 1980. However, since the recruiting commands had incorrect information on applicant AFQT scores in FY77, it is also appropriate to assess AFQT representativeness relative to applicant scores that the commands believed to be correct. Comparison of the mean of the miscalibrated applicant AFQT scores with that of male youth in 1980 (see Table 16) shows that the FY77 recruiting process produced: (1) a male applicant pool with essentially the same mean AFQT score as 18 to 23 year old males and (2) a male accession group with a mean AFQT score about 5 points above the mean for 18 to 23 year old males.

Annual income. The average annual household income of the applicant's zip code of home of record was used as a rough barometer of

Table 16

AFQT REPRESENTATIVENESS OF FY77 MALE APPLICANTS AND ACCESSIONS

Group	Mean AFQT Score	
	Properly Calibrated	Miscalibrated
1980 male youth[a]	50.8	N.A.
1977 male applicants[b]	43.1	49.7
1977 male accessions[b]	48.3	55.4

[a]From Table C-1, U.S. Department of Defense (1982), p. 77.

[b]From Table 26, text.

applicants' socioeconomic status. This measure is not very discriminating since it refers to an aggregate population rather than to the particular individual's household. Nonetheless, it can be expected to discriminate between grossly different circumstances (e.g., an impoverished central city neighborhood versus a middle or upper class suburban area).

This income measure proved to have little effect on accession rates, but does affect the pattern of losses from the recruiting process (Tables 17 and 18). Not surprisingly, income is negatively related to AFQT failure and positively related to PQ and QNE losses.

Marital and dependency status. As Table 19 reveals, 90 percent of the FY77 applicants were single, without dependents. Being married depressed male accession rates, the negative effect increasing with the number of dependents. Marital and dependency status was not particularly related to AFQT failure rates. Marriage and dependents reduced accession rates by higher rates of PQ and QNE losses and medical failures,[18] even when we calculate PQ and QNE losses as percentages of all those mentally qualified and fully qualified, respectively (Table 20).

Single applicants with dependents are a mixed group, containing both single parents and persons who must care for a financially dependent parent. In general, single applicants with child dependents cannot enlist in the active-duty military. However, in borderline cases recruiters can request a waiver, which may or may not be granted. If

[18] The higher medical failure rates are probably attributable to the medical problems of increased age, those married and/or with dependents tending to be older than those unmarried and without dependents.

Table 17

FY77 APPLICANT OUTCOMES BY AVERAGE ANNUAL HOUSEHOLD INCOME OF APPLICANT'S ZIP CODE AREA
(DoD Males)

Average Annual Income[a]	Loss by Stage of Recruiting Process (Percent)						Total Accessions (Percent)	Percent of Applicants	Percent of Accessions	Number of Applicants
	AFQT Failure	PQ Loss	Medical Failure	QNE Loss	DEP Loss	Total Losses				
$1,000 - $9,999	20.9	18.6	4.1	3.2	1.6	48.7	51.4	7.9	7.3	46,267
$10,000 - $12,999	16.8	19.5	4.3	3.2	1.7	45.6	54.4	38.2	37.7	224,936
$13,000 - $15,999	12.2	21.6	4.1	4.2	1.9	44.0	56.0	33.6	34.1	197,587
$16,000 - $21,999	8.7	23.4	4.5	4.5	1.9	43.2	56.8	18.1	18.7	106,779
≥ $22,000	5.7	25.1	5.3	6.0	1.8	44.1	55.9	2.2	2.3	13,150

[a]This variable refers to the average annual household income of the applicant's home of record zip code area.

Table 18

FY77 APPLICANT COHORT: LOSS AS A PERCENTAGE OF THOSE REMAINING IN POOL BY AVERAGE ANNUAL INCOME OF APPLICANT'S ZIP CODE AREA
(DoD Males)

Average Income	PQ Loss as Percent of All Those Mentally Qualified	QNE Loss as Percent of All Those Fully Qualified
$1,000 - $9,999	23.6	5.7
$10,000 - $12,999	23.4	5.4
$13,000 - $15,999	24.6	6.7
$16,000 - $21,999	25.7	7.2
$\geq$ $22,000	26.7	9.4

Table 19

FY77 APPLICANT OUTCOMES BY MARITAL AND DEPENDENCY STATUS
(DoD Males)

Marital and Dependency Status	Loss by Stage of Recruiting Process (Percent)						Accessions (Percent)	Percent of Applicants	Percent of Accessions	Number of Applicants
	AFQT Failure	PQ Loss	Medical Failure	QNE Loss	DEP Loss	Total Losses				
Single, no dependent	14.0	19.8	4.1	3.6	1.8	43.4	56.6	90.0	91.8	558,198
Single, 1-9 dependents	17.1	33.6	6.1	6.8	0.9	64.5	35.5	0.8	0.5	4,844
Married, 0-1[a] dependent	11.6	26.6	5.1	5.1	1.5	50.0	50.0	4.2	3.8	25,846
Married, 2-3 dependents	15.5	27.9	5.1	5.9	1.5	56.2	43.8	4.8	3.8	30,001
Married, 4-9 dependents	13.8	44.2	8.3	12.6	1.1	80.4	19.6	0.2	0.1	1,416

[a]One dependent could mean a spouse or a child. See App. B.

Table 20

FY77 APPLICANT COHORT: LOSS AS A PERCENTAGE OF THOSE REMAINING IN POOL BY MARITAL AND DEPENDENCY STATUS (DoD Males)

Marital and Dependency Status	PQ Loss as Percent of All Those Mentally Qualified	QNE Loss as Percent of All Those Fully Qualified
Single, no dependent	17.4	4.0
Single, 1-9 dependents	40.5	15.8
Married, 0-1 dependent[a]	30.1	8.9
Married, 2-3 dependents	33.1	11.4
Married, 4-9 dependents	51.3	37.3

[a]One dependent could mean a spouse or one child. See App. B.

the single applicant's dependents are not children, e.g., financially dependent parents, he or she can enlist.

We suspect that some of the PQ and QNE losses for this group are in fact disqualifications on dependency grounds. Information about an applicant's dependents can emerge, and waiver decisions can be made, at any point in the recruiting process. The ARS records may not always be updated to reflect such disqualifications.

The marital and dependency variable is one of the few variables we examined that affects male and female applicants differently: Female accession rates were unrelated to marital status.

Type of residence. Type of residence had little effect on accessions (Table 21). It did not significantly affect losses at any stage of the recruiting process. AFQT failure rates were highest among those from the core counties of large metropolitan areas and lowest among those from the fringe counties of these areas. PQ losses as a percentage of the mentally qualified and QNE losses as a percentage of those fully qualified are shown in Table 22. The most rural areas produced the lowest--although not much lower--PQ and QNE loss rates, a result consistent with the possibility that these areas offer youth the fewest social and economic opportunities.

Economic subregion.[19] As Table 23 shows, total accessions are only weakly associated with this variable: rates range from 51.3 percent (Mississippi Delta) to 63.7 percent (Northern Great Plains). The subregional distributions of the initial applicant pool and of the final accessions differ little from each other.

The sources of loss, however, vary markedly among subregions. AFQT failure rates range from 6 percent for the Dairy Belt to 28 percent for the Mississippi Delta. Medical failure rates calculated as a percentage of those who took the medical examination produce rates ranging from 4.0 for the Northern Appalachian coal fields to 12.3 for the Southern Great Plains. These subregional variations in AFQT and medical failure rates reflect (among other things) subregional differences in the quality of schooling and health care, as well as differences in socioeconomic composition.

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[19] See Fig. 2 for definition of these subregions.

Table 21

FY77 APPLICANT OUTCOMES BY RESIDENTIAL TYPE
(DoD Males)

Residential Type (County Population)	Loss by Stage of Recruiting Process (Percent)						Total Accessions (Percent)	Percent of Applicants	Percent of Accessions	Number of Applicants
	AFQT Failure	PQ Loss	Medical Failure	QNE Loss	DEP Loss	Total Losses				
≥ 1,000,000 (core)	15.9	21.3	3.9	3.8	1.9	46.9	53.1	27.4	26.2	166,095
≥ 1,000,000 (fringe)	10.9	19.9	4.4	5.0	1.8	42.2	57.8	11.1	11.6	67,377
250,000 - 999,999	13.0	21.1	4.2	4.1	1.6	44.2	55.8	24.3	24.4	147,158
50,000 - 249,999 or ≥ 20,000 urban residents	12.9	21.9	3.9	3.6	1.6	44.0	56.0	21.4	21.5	129,702
0 - 19,999 urban residents	13.9	18.3	5.0	3.1	1.9	42.4	57.6	15.8	16.3	95,562

Table 22

FY77 APPLICANT COHORT: LOSS AS A PERCENTAGE OF THOSE REMAINING IN POOL BY TYPE OF RESIDENCE
(DoD Males)

Residential Type (County Population)	PQ Loss as Percent of All Those Mentally Qualified	QNE Loss as Percent of All Those Fully Qualified
≥ 1,000,000 (core)	25.3	6.4
≥ 1,000,000 (fringe)	22.3	7.8
250,000 - 999,999	24.3	6.7
50,000 - 249,999 or ≥ 20,000 urban residents	25.1	5.8
0 - 19,999 urban residents	21.3	4.9

Table 23

FY77 APPLICANT OUTCOMES BY ECONOMIC SUBREGION
(DoD Males)

Economic Subregion	Loss by Stage of Recruiting Process (Percent)						Total Accessions (Percent)	Percent of Applicants	Percent of Accessions	Number of Applicants
	AFQT Failure	PQ Loss	Medical Failure	QNE Loss	DEP Loss	Total Losses				
Northern New England-St. Lawrence	9.0	22.2	4.1	6.3	1.2	42.8	57.2	1.0	1.0	6101
Northeastern Metropolitan Belt	14.8	17.7	4.0	6.2	1.4	44.1	55.9	18.6	18.6	112552
Mohawk Valley and New York-Pennsylvania Border	8.9	20.1	3.7	9.4	1.3	43.4	56.6	3.6	3.6	21516
North Appalachian Coal Fields	9.8	17.2	2.9	7.5	2.1	39.5	60.5	2.8	3.0	16805
Lower Great Lakes Industrial	13.4	20.7	3.9	4.0	2.1	44.1	55.9	14.3	14.4	86898
Upper Great Lakes	7.7	22.5	4.4	2.8	2.3	39.7	60.3	0.9	1.0	5539
Dairy Belt	6.0	18.4	7.5	3.7	1.5	37.2	62.8	1.6	1.8	9642
Central Corn Belt	9.6	20.3	4.8	5.4	2.3	42.4	57.6	2.8	2.9	17284
Southern Corn Belt	13.6	24.7	4.9	1.8	1.9	46.9	53.1	3.7	3.5	22330
Southern Interior Uplands	11.2	22.7	4.9	1.9	1.9	42.7	57.3	3.1	3.2	19045
Southern Appalachian Coal Fields	14.0	18.6	6.3	2.4	1.4	42.7	57.3	0.8	0.8	4915
Blue Ridge, Great Smokies, and Great Valley	13.7	20.7	4.8	2.6	1.5	43.3	56.7	1.4	1.4	8344
Southern Piedmont	16.4	21.2	3.1	2.0	1.7	44.4	55.6	4.3	4.3	25912

(continued)

Table 23 (continued)

Economic Subregion	Loss by Stage of Recruiting Process (Percent)						Total Accessions (Percent)	Percent of Applicants	Percent of Accessions	Number of Applicants
	AFQT Failure	PQ Loss	Medical Failure	QNE Loss	DEP Loss	Total Losses				
Coastal Plain Tobacco and Peanut Belt	22.6	16.0	2.8	2.6	1.4	45.4	54.6	1.8	1.7	10693
Old Coastal Plain Cotton Belt	21.4	19.5	2.9	1.5	1.5	46.7	53.3	4.0	3.8	24181
Mississippi Delta	28.0	12.7	4.8	2.0	1.2	48.7	51.3	1.2	1.1	7228
Gulf of Mexico and Southern Atlantic Coast	20.0	20.1	4.7	1.9	1.6	47.1	52.9	4.5	4.3	27225
Florida Peninsula	10.0	29.1	2.2	2.1	1.3	44.7	55.3	3.5	3.4	20938
East Texas and Adjoining Coastal Plain	16.6	15.6	6.0	2.9	1.2	42.3	57.7	2.6	2.7	15591
Ozark-Ouashita Uplands	15.2	21.9	6.3	2.1	1.4	47.0	53.0	1.5	1.4	9040
Rio Grande	15.3	12.9	6.6	3.9	1.7	40.5	59.5	2.4	2.5	14276
Southern Great Plains	12.5	20.2	8.3	3.1	1.7	45.6	54.4	1.9	1.8	11218
Northern Great Plains	8.2	12.9	7.2	5.7	2.3	36.3	63.7	1.7	1.9	10276
Rocky Mountain, Mormon Valleys, and Columbia Basin	8.5	23.2	6.6	2.5	1.7	42.4	57.6	1.6	1.6	9436
Northern Pacific Coast (including Alaska)	9.2	23.6	5.6	4.1	1.8	44.3	55.7	2.5	2.5	15380
The Southwest (including Hawaii)	12.0	27.8	2.9	1.9	2.3	46.8	53.2	12.1	11.6	73529
TOTAL	13.7	20.8	4.2	3.8	1.8	44.3	55.6	NA	NA	605894

PQ loss rates (PQ losses as a percentage of the mentally qualified) range from 14 percent (Northern Great Plains) to 31.5 percent (Southwest), as shown in Table 24. QNE loss rates (QNE losses as a percentage of the fully qualified) range from 2.7 percent (Old Coastal Plain Cotton Belt) to 14 percent (Mohawk Valley and New York-Pennsylvania Border). These variations may reflect differences in any one or all three of the following: (1) civilian economic and educational opportunities, (2) preferences for military service, (3) the efficiency of recruiting commands.

SUMMARY

In FY77, DoD accessed 51 percent of all male and female applicants who entered the test process. They rejected another 21 percent and failed to access 28 percent of the partially or fully qualified applicants. AFQT failures accounted for four-fifths of the disqualifications; medical failures, for a fifth. The single largest source of applicant loss was the partially qualified category. This group represented a quarter of all applicants and almost 30 percent of all mentally qualified applicants. By contrast, fully qualified and DEP losses were small: only 4 percent of the total applicant pool (or a sixth of all partially qualified losses), 5 percent of all mentally qualified applicants, and 7 percent of all fully qualified applicants.

We found systematic relationships between applicant characteristics and recruiting outcomes.

- The major losses invariably were concentrated in the AFQT failure and PQ categories, regardless of the applicant characteristic.

Table 24

FY77 APPLICANT COHORT: LOSS AS A PERCENTAGE OF THOSE REMAINING IN POOL BY ECONOMIC SUBREGION
(DoD Males)

Economic Subregion	PQ Loss as Percent of All Those Mentally Qualified	QNE Loss as Percent of All Those Fully Qualified
Northern New England-St. Lawrence	24.4	9.7
Northeastern Metropolitan Belt	20.8	9.7
Mohawk Valley and New York-Pennsylvania Border	22.1	14.0
North Appalachian Coal Fields	19.1	8.3
Lower Great Lakes Industrial	24.0	6.4
Upper Great Lakes	24.3	4.3
Dairy Belt	19.6	5.5
Central Corn Belt	22.4	8.3
Southern Corn Belt	28.6	3.2
Southern Interior Uplands	25.6	3.2
Southern Appalachian Coal Fields	21.6	3.9
Blue Ridge, Great Smokies, and Great Valley	24.0	4.3
Southern Piedmont	25.4	3.4

(continued)

Table 24 (continued)

Economic Subregion	PQ Loss as Percent of All Those Mentally Qualified	QNE Loss as Percent of All Those Fully Qualified
Coastal Plain Tobacco and Peanut Belt	20.7	4.4
Old Coastal Plain Cotton Belt	24.8	2.7
Mississippi Delta	17.6	3.7
Gulf of Mexico and Southern Atlantic Coast	23.8	3.3
Florida Peninsula	32.4	3.5
East Texas and Adjoining Coast Plain	18.7	4.8
Ozark-Ouashita Uplands	25.9	3.7
Rio Grande	15.3	6.0
Southern Great Plains	23.0	5.2
Northern Great Plains	14.0	8.0
Rocky Mountain, Mormon Valleys, and Columbia Basin	25.3	4.1
Northern Pacific Coast (including Alaska)	26.0	6.7
The Southwest (including Hawaii)	31.5	3.2

- AFQT failure rates, medical failure, PQ loss rates, and QNE loss rates typically varied among the different segments of the applicant population.
  - -- Relative to males, females exited at higher rates from every stage of the recruiting process. Sex differences in AFQT failure rates were attributable to the different mental standards that some services had for men and women in FY77.
  - -- Blacks and Hispanics had three times the AFQT failure rates of whites.
  - -- Compared with high school graduates, being a high school nongraduate tripled AFQT failure rates. Having even one year of college dramatically increased PQ and QNE loss rates.
  - -- Of those who passed the AFQT, higher scores increased PQ and QNE loss rates.
  - -- Being older increased PQ losses, medical failures, and QNE losses.
  - -- Coming from a zip code area with higher average household income noticeably reduced AFQT failure rates, and increased--but by only a small amount--PQ and QNE losses.
  - -- Being married decreased male accession rates, the negative effect increasing with the number of dependents. Marriage and dependents reduced accessions by increasing PQ losses, QNE losses, and medical failures.

-- Economic subregions affected accession probabilities and the probabilities of different sources of loss prior to accession. Accessions ranged from 51 to 64 percent; AFQT failures, from 6 to 28 percent; medical failures, from 4 to 12 percent; PQ losses, from 14 to 32 percent; and QNE losses, from 3 to 14 percent.

- o Medical failure rates varied strongly with age, and relationships between these rates and characteristics such as marital status were attributable to the relationship between such characteristics and age.
- o DEP loss rates showed little variation by applicant characteristic, even when variations in losses before DEP enlistment had been eliminated.
- o If characteristics of accessions did not mirror the distribution of those characteristics in the total youth population, their unrepresentativeness was primarily attributable to that of the applicant pool, not to unrepresentative exits from that pool. The recruiting process generally operated to increase, not decrease, representativeness.

IV. SIMILARITIES AND DIFFERENCES AMONG SEVEN RECRUITING OUTCOME GROUPS

INTRODUCTION

When the military services need additional accessions or wish to increase their recruiting efficiency, it is useful to know what types of persons might be most readily accessed. In this section, we determine how individuals who exit from the recruiting process differ from those who access. Our objective is to demonstrate how potential sources of accessions might be identified among qualified losses.

In today's recruiting market (1982), the services are meeting their numeric and qualitative accession requirements. However, recruiting markets can shift dramatically in short periods of time--the difference between the markets of FY79 and FY82 is a case in point. If the market deteriorates, analyses such as this one can reveal the accession potential of applicants lost in the recruiting process.

Even when accession requirements are being met, recruiting costs may be unnecessarily high if substantial numbers of qualified applicants who are similar to accessions are lost. The service recruiting commands invest considerable time even in applications that become partially qualified losses. If the fraction of losses relative to accessions is large, there may be room to improve the efficiency of the process, i.e., to increase accessions from the same recruiting pool. Reducing losses may require costly changes in enlistment incentives (if, for example, there are unmeasured differences between qualified losses and accessions). However, these losses may also be reducible by much less costly recruiting management changes.

Implications of the Analysis

This analysis carries an important qualification. It can only demonstrate the possibility of improving the efficiency of the recruiting process. Our data show only if a FY77 applicant group that exits from the recruiting process differs from FY77 accessions--and only for variables measured in the ARS. Thus, if the analysis shows that a qualified loss group differs from accessions on the variables measured, those differences furnish clues as to changes in incentives that might enlist this group of applicants. However, if no differences emerge, we cannot necessarily conclude that the group can be enlisted with the same incentives that attracted the accessions since the possibility of unmeasured differences remains.[1] We know only that (1) the services cannot rule out this possibility and (2) the possibility is stronger than it was before the test for differences between qualified losses and accessions.

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[1] For example, variations in civilian employment and educational opportunities strongly affect enlistment rates, the rates increasing as these opportunities decline. The FY77 Applicant Cohort File measures important variables (minority status, educational attainment, basic skills, age, residential location) associated with differences in youth employability at any point in time and within an area (see, for example, Nilsen (1981); National Commission for Employment Policy (1979); Freeman and Wise (n.d.); Meyer and Wise (1980)). Thus, if the enlistment decision is simply an employment decision, the FY77 variables may adequately measure major enlistment-relevant differences among applicants.

Many military applicants, however, want postsecondary education. For example, out of an interview sample of 3,536 applicants, Orvis and Hawes (forthcoming) found that 13.4 percent aspired to some college, 42.1 percent to four years of college, and 15.5 percent to postgraduate work. In total, 71 percent wanted at least some postsecondary education. Preliminary results of the educational benefits experiment indicate that high-quality applicants vary in their enlistment rates, depending on the intensity of their postsecondary educational commitment, their perceived need for educational financing, and their appraisal of military versus civilian sources of educational financing (Orvis and Hawes (forthcoming)). The FY77 file does not measure these variables.

STATISTICAL METHODOLOGY

Pairwise discriminant analysis was used to test for differences between each pair of the seven recruiting outcome groups.[2] For each pair of groups, discriminant analysis finds the linear combination of variables (known as the linear discriminant score function) that best differentiates members of one group from those of the other. This function is useful because it pinpoints the key dimensions of difference, i.e., which variables matter the most.[3]

Discriminant analysis quantifies the distance between two groups in standardized units between the multivariate means of the two populations.[4] Figure 5 shows distributions of the discriminant scores for four hypothetical pairs of groups that have distances of 0.25, 0.50, 0.75, and 1.00, respectively.[5]

The distance determines the probability of correctly classifying an individual chosen at random from one of the two groups.[6] This probability is another way of illustrating the similarity or difference between groups. If two groups are identical, their distance would be 0.00 and the probability of correct classification would be 0.50, i.e.,

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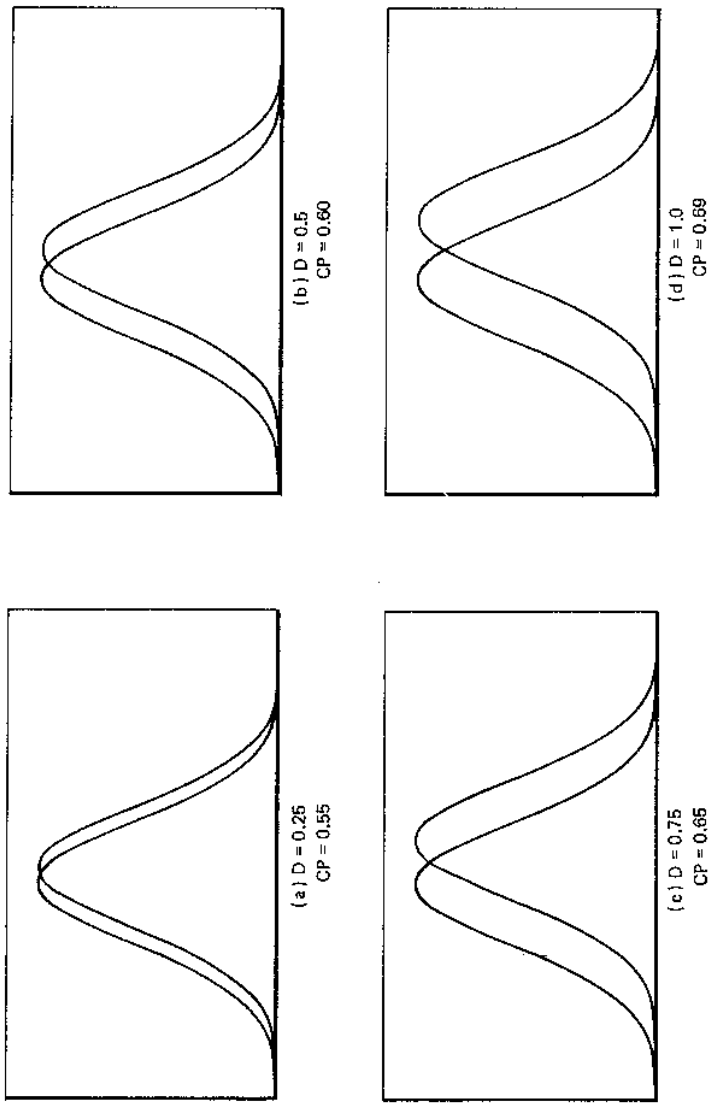
[2] See Lachenbruch (1975) for details on discriminant analysis.

[3] A typical use of discriminant analysis (although not ours here) is to classify individuals into groups when their groups are unknown. To do so, one would compute the individual's score (as a function of measured characteristics) and assign him to the group from which that score was more likely to have come.

[4] This distance is technically known as the Mahalanobis distance.

[5] Although most of the independent variables in our study are discrete, we can still expect the discriminant scores within each group to have approximately normal distributions, as shown in Fig. 5.

[6] This assumes equal prior probabilities, i.e., that the two groups are of equal size.



D = Distance between multivariate means
CP = Classification probability

Fig. 5—Overlap between two normal populations for various distances

no better than chance. Figure 5 shows how the probabilities of correctly classifying an individual increase as the distance increases from 0.25 to 1.00.

DIFFERENCES BETWEEN MALE RECRUITING OUTCOME GROUPS

Table 25 gives the distances between each pair of male recruiting outcome groups. Whether we compare the five exit groups with direct ship, DEP, or all accessions, the rank order of differences between exit group and accession group is the same: AFQT failures > QNE losses > medical failures > PQ losses > DEP losses. If we compared only the distances of the first and last exit groups (AFQT failures versus DEP losses), we might conclude that the recruiting process creates an increasingly homogeneous applicant population, presumably by the cumulative elimination of those not wanted by and who did not want to join the military services. However, the full rank order reveals a reversal between the PQ and QNE losses. PQ losses exit second from the process, but are the second most similar to accessions; QNE losses exit fourth, but are the second least similar to accessions.

AFQT Failures

Since AFQT and aptitude scores define an AFQT failure, we excluded these scores in all pairwise comparisons that involved the AFQT failure group. Thus, the distances reported in Table 25 between AFQT failures and each other outcome group represent the difference independent of the mental ability measures that initially differentiated them from all other groups.

Table 25

DISTANCES[a] BETWEEN FY77 RECRUITING OUTCOME GROUPS
(DoD Males)

Recruiting Outcomes	Recruiting Outcomes						
	PQ Losses	Medical Failures	QNE Losses	DEP Losses	Direct Ship Accessions	DEP Accessions	All Accessions
AFQT failures	1.02[b]	1.03	1.34	0.90	0.87	1.07	1.01
PQ losses		0.21	0.38	0.37	0.41	0.59	0.53
Medical failures			0.37	0.42	0.49	0.64	0.59
QNE losses				0.58	0.73	0.89	0.85
DEP losses					0.23	0.34	0.27
Direct ship accessions						0.41	

[a]The distance in standard units between the multivariate means of two populations.

[b]All distances reported in this table are statistically significant at $p < .0001$.

AFQT failures were the group most distant from all other outcome groups, not just accessions. Figure 5 provides a basis for judging what the different distances mean in terms of overlaps between any two groups being compared. The similarity between two groups with distances of one standard deviation (e.g., the distance between AFQT failures and PQ losses) is depicted in Fig. 5d. For a distance of the amount between AFQT failures and QNE losses (1.34), the two groups are less similar than the two populations depicted in Fig. 5d.

Table 26 shows what these distances mean with regard to correctly classifying an AFQT failure. Using all FY77 file variables except mental ability, we can in general correctly classify 7 out of 10 male AFQT failures relative to each other outcome group. Thus, these variables increase our accuracy over chance by 40 percent. Relative to QNE losses, we can correctly classify 7.5 out of every 10 AFQT failures.

Not surprisingly, AFQT failures differed from each of the other outcome groups in ways negatively associated with civilian employment and educational opportunities. They were much more apt to be high school nongraduates,[7] less apt to have any college, were poorer, much more apt to come from a minority, and were younger. The characteristic that disqualified them, low mental ability scores, is also negatively related to civilian employment and educational opportunities.

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[7] AFQT scores are positively related to educational attainment (see, for example, Table C-2, Department of Defense (1982)). Relative to the other outcome groups, non-high-school graduates in the AFQT failure group are much more likely to be high school dropouts than high school seniors.

Table 26

PROBABILITIES OF CORRECTLY CLASSIFYING INDIVIDUALS INTO RECRUITING OUTCOME GROUPS
(DoD Males)

	Recruiting Outcomes						
Recruiting Outcomes	PQ Losses	Medical Failures	QNE Losses	DEP Losses	Direct Ship Accessions	DEP Accessions	All Accessions
AFQT failures	0.69	0.70	0.75	0.67	0.67	0.70	0.69
PQ losses		0.54	0.57	0.57	0.58	0.62	0.61
Medical failures			0.57	0.58	0.61	0.63	0.62
QNE losses				0.61	0.64	0.67	0.66
DEP losses					0.54	0.57	0.55
Direct ship accessions						0.58	

Partially Qualified Losses

Partially qualified losses are a group of particular interest because they are a potentially fertile source of accessions. The males in this group were most similar to medical failures (see Table 25). They differed from direct ship accessions by no more than direct ship accessions differed from DEP accessions.

Although PQ losses differed more from DEP accessions than from the other groups, Table 26 shows that this additional difference translates into little additional ability to differentiate PQ losses from DEP accessions. Relative to direct ship accessions, we can correctly classify 5.7 out of every 10 PQ losses; relative to DEP accessions, 6.2 out of every 10 PQ losses.

Partially qualified losses differ from direct ship accessions in ways that are consistent with the better civilian employment and educational opportunities that they enjoy: They are more likely to have some college; be more intelligent (even controlling on educational attainment); older; from higher-income zip code areas; and disproportionately nonminority. They are more likely to be high school nongraduates when AFQT and age are controlled, but we can reasonably assume that a PQ nongraduate is more likely to be a high school senior than a direct ship nongraduate. Direct ship accessions ship out on the day that they successfully test. If we assume little elapsed time between the recording of the applicant's educational attainment and the time of testing, a nongraduate direct ship accession is more likely to be a high school dropout.

PQ losses differ from DEP accessions on the same variables as direct ship accessions, but some of the signs differ. Although the amount of difference between PQ losses and DEP accessions is greater than that between PQ losses and direct ship accessions, the nature of the differences less clearly implies differences in civilian options.

In interpreting the data on PQ losses, several points should be kept in mind:

1. In future analyses, it will be possible to distinguish high school dropouts from soon-to-graduate seniors. With this critical improvement in the data, PQ losses may prove to be primarily high school seniors, not dropouts.[8] If so, it might be argued that these seniors constitute a "shopper" group without strong military commitment. However, PQ losses have talked to a recruiter and taken the production ASVAB--both expressions of interest in the military. Among high school seniors, commitment to <u>any</u> prospective occupation is quite volatile,[9] suggesting that by moving fast and "staying with the case," recruiters may secure an enlistment.
2. PQ losses are almost indistinguishable in their measured background characteristics from medical failures, but the two groups differ in their applicant behavior. Unlike the PQ

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[8] Results of multi-group discriminant analyses, described later, suggest that this is the case.

[9] Studies indicate that most youth take the first job that they are offered (e.g., Osterman (undated)). Other studies document substantial migration between majors at the college level (e.g., Davis (1965); Astin and Panos (1969)), i.e., for youth only slightly older than high school seniors.

losses, the medical failures proceeded to the next stage of the process. If these two groups do not differ in unmeasured ways, the recruiting systems themselves account for the difference in their recruiting outcomes.[10] In this case changes in these systems may increase accessions.

3. The PQ group is not the same as either accession group. However, in FY77 it substantially overlapped the accession population, especially the direct ship population. Although the nature of the difference between PQ losses and direct ship accessions was consistent with less military commitment in the PQ group, the amount of difference between the two groups was still small. In other words, many individuals in the PQ groups were not distinguishable from ones in an accession group. PQ losses either differed from accessions in unmeasured ways, or many of these losses could have ended up as accessions as easily as losses.

Medical Failures

Medical failures are more similar to PQ, QNE, and DEP losses than to accessions. However, the classification probabilities show that medical failures do not differ that much from any of the groups. Depending on the comparison group, the FY77 variables let us correctly classify between 5.4 and 6.3 out of every 10 medical failures, a batting average little better than chance (see Table 26).

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[10] Recruiting systems could increase PQ losses in several ways, e.g., recruiters who fail to follow applicants closely can lose them. Service quotas for high school graduates can introduce selectivity into the process.

The data indicate that medical failures have fewer civilian educational and employment options than PQ and QNE losses. Although they differ more from accessions than from these two loss groups, the nature of the differences does not imply systematic differences between medical failures and accessions in educational and employment options.

As Table 4 in Sec. II shows, the FY77 medical failure group was not large: 26,000 individuals, or 4 percent of total applicants and 6.6 percent of all applicants who took the medical examination. However, if the services encounter recruiting problems and are willing to reduce medical standards, medical failures are a potential source of accessions. Of those who took and passed the medical examination in FY77, 93.5 percent accessed. We have no basis for expecting lower accession rates for medical failures. The data indicated that medical failures had fewer civilian options than QNE losses and no systematic differences from accessions in civilian options. The medical failure group also contained individuals otherwise desired by the services: 60 percent were AFQT categories I-IIIA and 60 percent at least high school graduates.

QNE Losses

As noted earlier, DoD male QNE losses differed more from direct ship and DEP accessions than any outcome group other than AFQT failures. They differed from direct ship accessions by about 0.75 of a standard deviation and by almost a full standard deviation from DEP accessions. Relative to direct ship accessions, we could correctly classify 6.4 out of every 10 QNE losses; relative to DEP accessions, 6.7 out of every 10 QNE losses.

Any classification of QNE losses still had considerable error in it--for example, we could correctly distinguish only 2 out of 3 QNE losses from DEP accessions. However, QNE losses differed from accessions, especially direct ship accessions, in ways that should have made military service less attractive to them. They had more civilian educational and employment options--they were older, less apt to be from a minority, more apt to have some college, and more apt to live in a large metropolitan area.[11] They were also more apt to be married with dependents. The geographic mobility[12] and family separations associated with military service should deter married more than single applicants.

The military service recruiting commands devote considerable management attention to QNE applicants. This attention can be credited for holding the final FY77 QNE numbers to 2.1 percent of all male applicants and to 3.6 percent of all fully qualified male applicants (see Table 4, Sec. II). The larger difference between QNE losses and accessions and the nature of the difference suggest that the services probably cannot reduce these numbers much further without changes in enlistment incentives.

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[11] Census data for 1977 show that compared with their nonmetropolitan counterparts, males ≥ 16 years of age from metropolitan areas have higher labor force participation rates, higher unemployment rates, and lower poverty rates. See U.S. Bureau of the Census (1978b), Table 11.

[12] See U.S. Bureau of the Census (1978c), Table 27.

DEP Losses

Not surprisingly, DEP losses did not differ much from either type of accession. They differed less from direct ship accessions than from DEP accessions, the group to which they originally belonged. The difference was, respectively, less than a quarter of a standard deviation and somewhat more than a quarter. The data improve our classification over chance by very little--relative to direct ship accessions, we can correctly classify only 5.4 out of 10 DEP losses; relative to DEP accessions, 5.7 out of 10 DEP losses.

DEP losses combined voluntary and involuntary exits from enlistment. If the FY77 DEP losses had high percentages of both kinds of exit, it is difficult to interpret data on DEP losses. At the same time, DEP losses had a much higher percentage of high school nongraduates than DEP accessions and about the same percentage as direct ship accessions (see Table A.1). To the extent that high school nongraduates among DEP losses signal high school dropouts, not high school seniors, DEP losses may represent the "leading edge" of the high attrition associated with first-term enlistees who are high school dropouts. In this case the main difference between DEP losses and direct ship accessions is that the latter, by definition, have no chance to exit between enlistment and accession. This interpretation of DEP losses and direct ship accessions can be checked for later accession years that distinguish high school seniors from dropouts.[13]

[13] If in fact the DEP loss group consists disproportionately of high school dropouts, the distinction between voluntary and involuntary DEP losses may be academic. High school dropouts differ from completers not only in their premature school exit, but also in behaviors that precipitate their being forced out of school.

Summary

This subsection violates the usual idea of a summary in that it presents new data. These data may, however, graphically summarize the earlier discussions. Figure 6 shows the two-dimensional[14] relationships among all seven outcome groups considered simultaneously.[15] (The discriminant analyses reported above showed relationships among pairs of outcome groups.) For DoD males, four characteristics push a group to the right on the horizontal axis: being a high school nongraduate, having at least some college, being older, and being white. Three characteristics push a group up on the vertical axis: coming from a large metropolitan area (central city and suburbs), being a high school nongraduate, and not having any college. The units on each axis represent a tenth of a standard deviation from the mean. Thus, fully qualified losses are about eight-tenths of a standard deviation away from DEP accessions on the horizontal axis.

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[14] The discriminant analyses reported above showed relationships on more than two dimensions. We restricted the analysis here to two discriminating dimensions to see the relationships among the seven groups in two-dimensional space. In many ways these two dimensions are analogous to the first two factors of a factor analysis. The cost of this restriction was minor. Since we initially conducted the analysis on the six mentally qualified groups, we could have differentiated them on as many as five dimensions. Of the variance that these five would have explained, the first dimension accounted for 72 percent of the variance; the first two together, a total of 83 percent of the variance. Thus, the last three dimensions together would have explained only an additional 17 percent of the variance.

[15] The scores of each of the six mentally qualified groups were used to define two discriminating dimensions that best separate the six groups. We excluded the mentally disqualified group since one of our independent variables, AFQT scores, determines that group. We subsequently computed where the mentally disqualified group would fall in the two-dimensional plot.

Figure 6 shows several intriguing things. First, being a high school nongraduate pushes an applicant along both axes. However, high school nongraduates on the horizontal axis are associated with those with at least some college; those on the vertical axis, with those without college. We suspect that the analysis is pulling apart those more apt to be high school seniors from those more apt to be high school dropouts.

Second, relative to the horizontal axis, the mentally disqualified and three enlistee groups are approximately the same. In the absence of military AFQT standards, Fig. 6 indicates that the mentally disqualified group contains numbers of potential enlistees, especially when we consider that the mentally disqualifieds differ primarily from the enlistee groups on characteristics associated with employment opportunities.

Third, DEP losses are closer to direct ship accessions on both axes than to DEP accessions. If high school nongraduates on the vertical axis in fact signal high school dropouts, not high school seniors, DEP losses may represent the "leading edge" of the high attrition associated with high school dropout, first-term enlistees. In this case the main difference between DEP losses and direct ship accessions is that the latter, by definition, have no chance to exit between enlistment and accession.

Fourth, although DEP accessions look extreme on both dimensions, they are in fact fairly similar to DEP losses, direct ship accessions, and mentally disqualifieds on the horizontal axis. They are quite similar to the partially qualifieds and physically disqualifieds on the vertical axis.

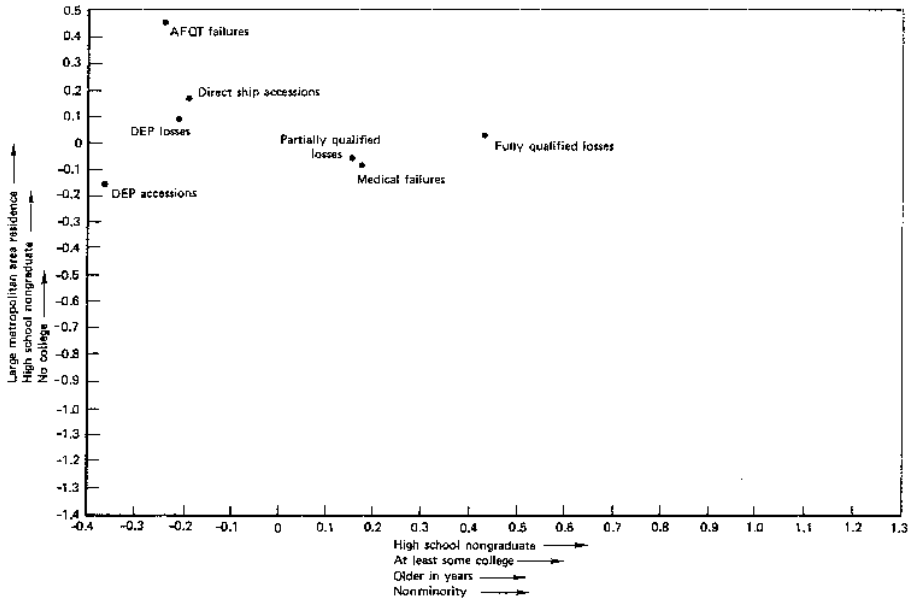

Fig. 6 — Multivariate relationships among seven applicant groups (DoD males)

Fifth, the partially qualifieds and medically disqualifieds are almost indistinguishable from each other. However, most of the latter proceeded one "gate" further in the accession process than did the partially qualifieds. We can interpret these results in two ways. First, just as DEP losses may be the leading edge of first-term enlisted attrition, the partially qualifieds may be the leading edge of voluntary applicant attrition. In this case the partially qualifieds represent applicants for which the military does not offer sufficient enlistment incentives.

The alternative interpretation is that the partially qualifieds signal recruiter failures or selectivity. The medically disqualifieds, a group very similar to them, indicate that recruiters should be able to get partially qualifieds to the next gate of the accession process. The question is then whether they would enlist if they pass the physical examination. They are not the same as either accession group, and, as earlier discussions showed, differ in ways that imply more employment options than the accession groups. However, they are not that different from either accession group and have large overlaps with each group.

If future analyses reveal that the partially qualifieds are primarily high school seniors, not dropouts, it might be argued that this is a "shopper" group without strong military commitment. However, the partially qualifieds talked to a recruiter and took the production ASVAB, indications of some interest in the military. Especially if the partially qualifieds are predominantly high school seniors, their commitment to <u>any</u> occupation is somewhat volatile. This volatility represents recruiter opportunity, although it also implies that recruiters have to move fast and "stay with the case" to secure an enlistment.

Finally, the fully qualified losses are the group most distant from each accession group. We suspect that even with changed enlistment incentives increased management attention would not produce many additional enlistments from this group. First, the group is small in terms of absolute numbers. Second, members of this group already receive a fair amount of management attention--they are visible in the system. Third, this figure and detailed comparisons reported earlier describe a group economically less in need of the military option and for whom

military service is difficult, i.e., they are more apt to be married with dependents.

DIFFERENCES BETWEEN FEMALE RECRUITING OUTCOME GROUPS

Table 27 reports the distances for females between each pair of recruiting outcomes. Table 28 shows the probabilities of classifying a random member of each pair into her correct outcome group.

For females the recruiting process seems to operate as we would expect. Except for medical failures, the applicant population becomes increasingly homogeneous as the process progresses. Compared with direct ship accessions, the five exit groups have the following rank order of distances: AFQT failures > medical failures > PQ losses > QNE losses > DEP losses. Compared with DEP accessions and all accessions, the order changes slightly: AFQT failures > PQ losses > QNE losses > medical failures > DEP losses. Multi-group discriminant analyses, which look at all of the outcome groups simultaneously, showed that except for the AFQT failure group the female outcome groups clustered together more tightly than did the male groups. The AFQT failure group was more distant from all other outcome groups for females than for males. Since the services generally had higher AFQT standards for females than for males in FY77 and since several of the ARS background variables correlate with AFQT scores, we would expect mentally qualified female applicants to be more homogeneous than mentally qualified males.

There is, thus far, no systematic theory of the incentives and disincentives of military service for females, and hence no framework for interpreting the data in Tables 27 and 28. Studies of women's occupational choices and our discussions with recruiters and female

Table 27

DISTANCES[a] BETWEEN FY77 RECRUITING OUTCOME GROUPS
(DoD Females)

Recruiting Outcomes	Recruiting Outcomes						
	PQ Losses	Medical Failures	QNE Losses	DEP Losses	Direct Ship Accessions	DEP Accessions	All Accessions
AFQT failures	0.86[b]	1.00	1.10	0.86	0.90	0.89	0.90
PQ losses		0.47	0.37	0.52	0.50	0.62	0.60
Medical failures			0.34	0.38	0.52	0.51	0.50
QNE losses				0.50	0.47	0.55	0.53
DEP losses					0.42	0.40	0.39
Direct ship accessions						0.30	

[a] The distance in standard units between the multivariate means of two populations.

[b] All distances reported in this table are statistically significant at $p < .0001$.

Table 28

PROBABILITIES OF CORRECTLY CLASSIFYING INDIVIDUALS INTO RECRUITING OUTCOME GROUPS
(DoD Females)

	Recruiting Outcomes						
Recruiting Outcomes	PQ Losses	Medical Failures	QNE Losses	DEP Losses	Direct Ship Accessions	DLP Accessions	All Accessions
AFQT failures	0.67	0.69	0.70	0.67	0.67	0.67	0.67
PQ losses		0.59	0.57	0.60	0.60	0.62	0.62
Medical failures			0.57	0.58	0.60	0.60	0.60
QNE losses				0.60	0.59	0.61	0.60
DEP losses					0.58	0.58	0.58
Direct ship accessions						0.56	

applicants indicate that women either do not consider exactly the same factors as men in an enlistment decision or weigh them differently. For example, military service remains a nontraditional choice for women, even if they pursue traditional occupations within the service (e.g., clerical work, dental technician). Marriage and children play a different part in their decisionmaking than in men's. We suspect that the ARS measures variables more central to men's than to women's choices.

SUMMARY AND CONCLUSIONS

This section has described the similarities and differences between each of the groups that exit from the recruiting process and those who access. For FY77 DoD male applicants, the five exit groups had a rank order of distance from accessions as follows: AFQT failures > QNE losses > medical failures > PQ losses > DEP losses. This rank order does not describe a recruiting process that creates an increasingly homogeneous applicant population as it proceeds, the positions of the PQ losses and QNE losses being reversed.

On the basis of the amount and nature of differences between each DoD male exit group and accessions for FY77, we concluded the following:

1. The PQ losses were a large potential source of quality accessions.
2. Had the services reduced medical standards, most medically disqualified applicants would probably have accessed.
3. The QNE losses were a much less likely potential source of accessions than were the PQ losses.

As noted earlier, these conclusions were based on variables measured in the ARS. As such, they represent possibilities only and for FY77 only. The exit groups may have differed or been similar to accessions in important unmeasured ways that would have altered our conclusions. Despite these qualifications, the ARS data clearly have great potential value for monitoring the enlistment process and discerning where there are opportunities to strengthen it.

In the following section, we consider how these data might be applied to managing the process.

V. A MANAGEMENT INFORMATION SYSTEM FOR THE RECRUITING COMMANDS

The Department of Defense and the military services already have information systems on applicants. With some changes, these systems could serve military managers more effectively. This section discusses the existing applicant information systems; recommends changes in data substance, access, quality, and entry time and in computer hardware and software; and illustrates how DoD and the recruiting commands might use the proposed information system.

The discussion raises three issues that we recognize but cannot resolve in the scope of this study.

1. Access: Who should have access to what information about which applicants? This question arises whenever the services discuss a single, on-line data system for applicants. For example, the services commonly express the fear that recruiters from one service will enter such a system and raid the names of applicants to another service. Although access decisions may be politically difficult to make,[1] they should be technically straightforward to implement.[2]

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[1] These decisions have to be made for unusual as well as usual circumstances. For example, in the FY77 applicant cohort about 10 percent of the applicants started the application process with one service and either completed it or enlisted with another. Although in general services should not have access to each other's applicant files, in this case it may be sensible to devise some rule that allows the transfer of the applicant record from the first to the second military service.

[2] A variety of "lock out" methods have been developed in the private and public sectors to restrict access to data bases.

2. Authority to modify data: Who will be allowed to add to or alter data in an applicant's file, and how are standards of accuracy to be maintained? This issue is analogous to the first one and the technical implementation of service and DoD decisions similarly straightforward.
3. Measurement and allocation of costs and benefits: If improved information systems generate costs savings and management benefits, they warrant the financial and organizational costs of implementing changes. But how are these benefits and costs to be measured and apportioned among the services? Estimating costs, cost savings, and management benefits requires substantial service and DoD input.

Although we are most familiar with the information needs of the Army Recruiting Command, our discussions with staff at the Defense Manpower Data Center (DMDC), the Military Enlistment Processing Command (MEPCOM), and the other service recruiting commands indicate that all services have such information needs, although in varying degrees. In what follows, we try to generalize about these problems, recognizing that specific exceptions may exist for one or another service.

As Table 29 shows, the management structures for the recruiting commands are almost identical, but the terms for the same level differ. For example, what is called a recruiting station in the Army and Navy is called an office in the Air Force and a recruiting sub-station in the Marine Corps. For simplicity we use Army terms when referring to the different management levels.

Table 29

RECRUITING COMMAND STRUCTURES OF THE ARMY, AIR FORCE, NAVY, AND MARINE CORPS

Service			
Army	Air Force	Navy	Marine Corps
Recruiting Command Headquarters	Recruiting Command Headquarters	Recruiting Command Headquarters	Recruiting Command Headquarters
Recruiting Region	Recruiting Group	Recruiting Area	Marine Corps District
District Recruiting Command (DRC)	Squadron	Navy Recruiting District (NRD)	Recruiting Station
Recruiting Area	Flight	Recruiting Zones[a]	[None]
Recruiting Station	Office	Recruiting Station	Recruiting Sub-station
Recruiter	Recruiter	Recruiter	Recruiter

[a]The Navy has no identifier for recruiting zones.

CURRENT INFORMATION SYSTEMS

After describing the different kinds of recruiting information systems that the services now use, we describe in some detail the characteristics of the main data base on applicants--the AFEES Reporting System (ARS).

Types of Information Systems

Two services use two, and two other services use three, formal systems of information about applicants. No service has a single, nonredundant system of information about an applicant.

The first system is service-specific and encompasses the pre-ASVAB part of the application process. It contains data on the number of applicant contacts or appointments for each recruiter. Only two services (Navy and Marine Corps) keep service-wide records of contact and appointment numbers.[3] These data are entered periodically, e.g., monthly. No service records indicators of contact or appointment quality, such as educational attainment.

The second type of information system is the AFEES Reporting System, which covers the application process from the ASVAB test to accession. The ARS is a DoD information system run by MEPCOM, a joint service command.[4]

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[3] The Air Force occasionally determines the number of contacts required to yield a certain number of accessions. However, they do not obtain routine information about this stage of the process. Army recruiters keep paper records on contacts and appointments, and their immediate superiors keep logs of these records. However, these data do not now enter any service-wide or DoD information system.

[4] Mental and medical testing was put under a joint command to protect the integrity of these processes. The responsibility for recording the information generated by testing (the ARS) was put under the same command.

The ARS staff enter background information (e.g., age) on each applicant who tests, the results of each test taken, and information about enlistment and accession. They also enter the recruiter identifier for each applicant who tests. However, only the Air Force recruiter identifier includes identifiers of all management levels responsible for the applicant. Identifiers of management levels above the recruiter are only entered for the other three services when the applicant signs a contract.

Data entry is delayed, i.e., the data are not entered at the time of the transaction between the applicant and the military. The entry schedule varies, depending on the transaction: three or fewer days to enter test results; two or fewer days to enter a DEP enlistment; the same day to enter an accession.

The military services have no on-line access to the ARS. The Army and Navy get daily ARS outputs on DEP enlistments and/or accessions.[5] Once a month each service receives a tape of all test, contract, and accession transactions for that service. Groups such as DMDC receive this tape for all four services.

The ARS data have unrealized potential for management. Ours is the first project to use the full range of ARS data to describe how many and what kinds of applicants exited at which points in the recruiting process.[6]

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[5] The Marine Corps and Air Force could receive these same daily outputs, but do not request them.

[6] DoD has obtained numerous tabulations from the ARS, but service recruiting headquarters have used ARS data in only limited ways. For example, the Air Force routinely uses the monthly ARS tape to check for evidence of fraud in the ASVAB tests by using the applicant's scores on those parts of the ASVAB that do not enter the calculation of the AFQT score to estimate an expected AFQT score for the applicant. If the applicant's actual AFQT score deviates substantially from his expected

The third kind of data base is service-unique: REQUEST (Army); PRIDE (Navy); PROMIS (Air Force); and Automated Systematic Recruiting Support System (ASRSS, Marine Corps). These on-line systems cover DEP enlistments and accessions only.[7] They were designed primarily as reservation systems--to reserve a training seat, a particular occupation, or another special option (e.g., unit location) for applicants who have signed contracts. However, these systems have taken on other functions, the most important being that they are one source used to evaluate recruiter and district recruiting commander performances. These systems, not the ARS, define the accessions for which recruiters get credit.

In sum, the military services and the DoD have multiple and somewhat redundant data systems on applicants. Not all services have centralized data on the number of contacts and appointments, and none has data on their quality or on-line access to data on applicants prior to enlistment. Only the Air Force can associate management levels other than the recruiter with applicants prior to enlistment.

ARS Data: Quality and Nature

On-line data and instantaneous entry are one important facet. However, the services' perceptions of the quality of these data affect their willingness to use it. The services trust the ARS less than their service-unique systems. The current nature of the data elements also limits the usefulness of these data.

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score, it is possible that he was illegally coached on those parts of the ASVAB that comprise the AFQT. The Air Force also sends squadron commanders a comparison of their accession performance with that of the other three services in their county (or counties).

[7] Air Force applicants can make reservations without having signed contracts.

Quality. Recruiters and their superiors are evaluated in part on the number and quality of the accessions they secure. Since credit for accessions comes from the data systems, recruiters watch this data element carefully. The services have all found that the ARS "loses" DEP enlistments and accessions at higher rates than do their own systems, which makes all ARS data suspect to the services. In fact, to our knowledge the services and DMDC have not documented the nature and magnitude of errors for all ARS data elements.[8]

All computerized data contain keypunch errors. DMDC estimates that ARS error rates are normal for how the data are now entered,[9] but high for the state of the art. MEPCOM has identified three data elements prone to error additional to normal keypunch error: the applicant's social security number (SSN),[10] the applicant's name, and the educational status of applicants who enter the ARS as high school seniors and access.[11]

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[8] In a November 1981 conference of ARS users the Army reported that they had compared the quality of REQUEST and the ARS for selected data elements, e.g., applicant's social security number, sex, and education.

[9] Data are now entered into the ARS by magnetic card typewriters, and keypunchers have to proof their work. Cathode ray tubes with built-in edit routines will replace typewriters.

[10] This data element is more prone to error than some others for several reasons: (1) recruiters' handwriting is not always easy to read; (2) an SSN is a long string of numbers and therefore error-prone; and (3) unlike the letters of a word, such as in a name, it is less easy to check the validity of any single number--they are relatively autonomous of each other.

[11] Many applicants test and enter DEP as high school seniors. When they access, the service guidance counselor verifies the applicant's educational status and is supposed to update it on the service record and ARS if that is appropriate. MEPCOM has no way of determining if the counselor changed the ARS record to accord with an applicant's change in educational status. If the educational status at DEP entry and accession are the same, the applicant may have failed to graduate from high school or the counselor may have failed to update the educational status.

Nature of ARS data. ARS data elements are basically the same today as in FY77, although high school seniors and high school dropouts are now distinguished and, as of August 1981, the recruiter's identification number is entered when each applicant first tests.

However, there are important variables missing from the ARS, and others are flawed by ambiguity:

- "Married with one dependent" does not distinguish a dependent spouse from a dependent child.
- The ARS has no adequate measures of the socioeconomic status (SES) of the applicant's family of origin.[12] Thus, managers and policymakers have no satisfactory way of comparing the SES distribution of applicants with that of the youth cohort from which they come, or of determining how SES affects attrition from the recruiting process.
- The ARS contains no measures of the applicant's current choice situation, e.g., employment status, postsecondary educational expectations, or need for postsecondary financial aid. If the recruiting commands routinely collected these data, they could track the relationships among applicant preferences and needs, military enlistment incentives, and the number and quality of applicants and accessions.
- As noted earlier, all services now have a recruiter identification number that is associated with each applicant

[12] Parental income is not only sensitive information, but military applicants often cannot report parental income accurately. Other useful SES indicators are father's occupation and mother's and father's years of schooling.

who tests. However, only the Air Force recruiter number also identifies the recruiter's group, squadron, flight, and office. The other services enter identifiers of these management levels only when the applicant signs a contract, and even at this point the Marine Corps and Navy identifiers do not identify the recruiting station (called sub-station in the Marine Corps).

- Although the ARS has a file position for the reason for DEP discharge, the reason is rarely coded. Thus, the services cannot use the ARS to distinguish DEP discharges who are disqualified for active duty from those who changed their minds about military service.
- Although the ARS has an applicant status code, it frequently is not updated to reflect the applicant's current status, e.g., fully qualified, but not enlisted. Since the applicant's status can be determined from data in other fields, the system could be programmed to automatically update status on the basis of these other fields.

In short, the service and DoD information systems on applicants do not cover the entire recruiting process, and the service-unique on-line systems and ARS are partly redundant of each other. The ARS data are underutilized, apparently because they are not easily accessible; they are entered too late to help process applicants; the services question the quality of ARS data; and the ARS lacks some important data elements.

RECOMMENDED CHANGES

We recommend certain changes in the current applicant data systems to increase their efficiency and effectiveness. Implementing these changes requires time, money, and joint DoD/service cooperation. Because of the scope of this project, we cannot estimate the costs of the proposed changes or suggest a realistic strategy for making them. However, we do not minimize the barriers to change, particularly to changes that require joint DoD/service cooperation.

1. We recommend one joint DoD/service, on-line, instantaneous data entry system that spans either ASVAB to accession or the full recruiting process (contact to accession). By "joint service" we mean a system of information about applicants to all the military services. The data elements would be common to all services, but each service could access information only on its own applicants, not those of other services.

By "on-line" we mean an interactive system (analogous to an airline reservation system), i.e., a data base that approved members of the recruiting commands can access and manipulate directly.[13] This feature would eliminate what we see as a major barrier to the services' use of the ARS. They cannot now easily access these data, and consequently the software has not been developed that would allow them to list or analyze the data for management purposes.

By "instantaneous data entry" we mean entering information on transactions as they occur. MEPCOM and service members responsible for processing applicants would work with data terminals, not with paper.

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[13] MEPCOM is now installing equipment at the AFEES that will give the services on-line access to ARS. Eventually MEPCOM hopes to set up a host-to-host access system.

The software package that allows data entry should have edit routines that check the validity of entered data, rejecting invalid data and requesting corrections at the time of entry.

If DoD or the services want systematic information about early stages of the recruiting process, the ARS should probably be extended to cover contacts and appointments. Computerized information on contacts and appointments may not, however, be particularly useful. For example, even the definition of a contact is a subject of some debate within the recruiting commands. If the information system is extended to cover the first stages of the recruiting process, the information entered should probably differ for a contact versus an appointment. It may be possible only to count contacts. It may be possible to add some indicator of quality (e.g., educational attainment) for appointments. Recruiters may collect enough information during an appointment to open a computer file on the individual. However, the services may not find a file useful at this point in the process, and the legality of opening a file at this juncture would have to be determined.

2. To implement the first recommendation, we suggest that the services introduce the hardware required for on-line access and instantaneous data entry. To use the capability that on-line systems provide, we also recommend that the services develop the software packages that allow managers at different levels of the recruiting command to manipulate the data to answer management questions.

3. We recommend that a joint DoD/service committee, including interested members of MEPCOM and DMDC, assess the quality of each data element in the ARS. If an element is found to be of unacceptable quality, those concerned about that element's accuracy should work out a

solution. For example, recruiters and district recruiting commanders want to receive proper credit for accessions and can be counted on to assure that the data system generates accurate accession data.

4. We recommend that a joint DoD/service committee, including representatives from the service personnel policy offices, MRA&L, and the different functions of the recruiting commands (e.g., marketing), periodically review the data elements routinely collected on applicants. The ARS does not now include data on certain management levels prior to enlistment for three of the military services. It has no data on certain applicant characteristics that different military manpower managers may need, e.g., the applicant's choice situation. We suggest that the committee consider adding data elements such as these. If elements are added or changed, these changes should be made at the start of a fiscal year.

In the next two subsections of this report, we describe examples of the uses to which the recruiting commands and DoD could put the suggested information system.

MANAGEMENT USES OF THE INFORMATION SYSTEM

The data system recommended here would provide a file for each applicant who keeps an appointment or who takes the ASVAB, depending on when DoD and the services want to start monitoring the recruiting process. The file contains three kinds of information: (a) applicant characteristics; (b) identifiers for each management level directly or indirectly responsible for the applicant; and (c) all qualification, contract, and accession transactions with the particular service. Multiple records yield counts and multiple records across time yield trends in counts. This data base can supply answers to any management

question that requires all or part of these three kinds of information for a single applicant or multiple applicants at a point in time or across time.

Consider the following examples of how managers can use this information system.

Marketing. The data base would enable the military services to to target national and regional advertising more effectively. Advertising groups could use this data base to determine current applicant profiles for different parts of the country. Across time they could use it to identify changes in applicant background characteristics, choices, and alternatives to military service that make it desirable to change advertising strategies.

Assessing the effects of changes in enlistment incentives. If the ARS routinely measures applicant preferences and needs that affect enlistment, it provides analysts with an interrupted time series experimental design. This design relies on measures of the key independent and dependent variables before and after the introduction of some change. If a change in enlistment incentives is introduced abruptly, not gradually, data collected before and after the policy change can be examined for evidence of a shift in the expected direction.

Recruiter selection and assignment. Headquarters can add to the applicant data base a file on the characteristics of production recruiters to ascertain which characteristics (e.g., recruiter age) predict recruiting performance. Such characteristics could be useful guides in selecting individuals for recruiting duty. Headquarters can also test for an "interaction effect," i.e., determine if certain

characteristics are effective in some, but not in other, markets (e.g., Hispanic recruiters in largely Hispanic areas). In this case the applicant data base can be used to "map" a recruiting jurisdiction in terms of applicant characteristics to which recruiter performance is sensitive. Recruiters can then be assigned to stations that fall in areas for which they are best suited.

Spotting unusually effective and ineffective elements in the system. Desired outcomes for any management unit can be analyzed statistically to identify recruiters, recruiting stations, recruiting areas, or district commands that are unusually effective. The outcomes can include taking the ASVAB, taking the medical examination, enlisting, and accessing.

The analytic strategy is the same as that devised by Klitgaard and Hall (1973) for spotting unusually effective and ineffective schools. The regression analysis controls on applicant background characteristics that have outcome effects independent of the recruiting command. (For example, age affects the probabilities of becoming a partially qualified loss, a factor outside the control of recruiting commands.) The regression results of interest in this analysis are the residuals from the regression line, not properties of the regression line itself, such as the variance explained. The variation that remains is attributed to recruiting management and to random variation.

This technique cannot ensure that outliers are in fact unusually effective or ineffective. By chance alone some units will be at the tails of the distribution of residuals. However, as Klitgaard and Hall point out, visual inspection of a histogram of residuals reveals whether the right and left tails are "lumpier" than would be expected from

random variation. Such lumps indicate that recruiters (or other management unit) are massed together in a discontinuous fashion. Discontinuities imply that groups of recruiters are using unusually effective (or ineffective) techniques. Another way of separating random from substantive variation is to monitor performance across time. If certain recruiters (or stations, areas, commands) fall consistently at one of the tails of the distribution of residuals, they are probably genuine rather than random outliers.

This regression strategy identifies potential performance outliers. Such analyses provide clues to genuine, as opposed to random, outliers. However, it does not tell--and the data base can do little to help--why these performance extremes occur. Unless it is felt that the strategies of particularly successful units can be generalized, the outliers of interest to managers are the unusually ineffective ones. Determining the source of the poor performance probably requires a troubleshooter.

The FY77 Applicant Cohort File contained only two management identifiers, the AFEES and the military services. As noted in App. B, we could not reliably infer the district recruiting command level from the AFEES identifier. Thus, we could not determine ineffective performers, controlling on characteristics of the unit's applicant pool that affect the outcomes in question. However, we did calculate PQ and QNE losses as a percentage of all applicants who took and passed the ASVAB and/or medical examination by AFEES and military service. As Table 30 shows, we see substantial variation within service and across AFEES. Table 31 shows the correlations between the percentage of these losses for different pairs of services within each AFEES. If we can

Table 30

DISTRIBUTION OF PARTIALLY AND FULLY QUALIFIED APPLICANT LOSSES AS PERCENTAGE OF ALL NOT DISQUALIFIED APPLICANTS BY AFEES AND SERVICE
(FY77 Applicant Cohort)

Percent Partially and Fully Qualified Loss	Army		Navy		Air Force		Marines		DoD	
	No. of AFEES	% of AFEES	No. of AFEES	% of AFEES	No. of AFEES	% of AFEES	No. of AFEES	% of AFEES	No. of AFEES	% of AFEES
5 - 9							(2)	3.0		
10 - 14							(4)	6.1		
15 - 19	(6)	9.0					(8)	12.1		
20 - 24	(4)	6.1	(4)	6.1			(12)	18.2	(4)	6.1
25 - 29	(13)	19.7	(12)	18.2	(7)	10.6	(15)	22.7	(12)	18.2
30 - 34	(24)	36.4	(17)	25.8	(18)	27.3	(13)	19.7	(31)	47.0
35 - 39	(15)	22.7	(23)	34.8	(19)	28.8	(9)	13.6	(17)	25.8
40 - 44	(2)	3.0	(9)	13.6	(18)	27.3	(2)	3.0	(2)	3.0
45 - 49	(2)	3.0	(1)	1.5	(4)	6.1	(1)	1.5		

assume that AFEES indicates the same recruiting market for all services that use it, very high correlations between all pairs of services would indicate either that all four services conducted equally effective (or ineffective) recruiting--unlikely--or that market primarily determines the observed variation in PQ and QNE losses. Most of the correlations are moderate in size. Thus, we can attribute some of the variation in these losses either to uniformly effective (or ineffective) recruiting across services within an AFEES or to variations in the market. However, since these correlations are by no means perfect, the services also either vary in their attractiveness to the same market or vary in the effectiveness of their management practices.

Table 31

CORRELATIONS OF PARTIALLY AND FULLY QUALIFIED LOSSES[a] BETWEEN SERVICES WITHIN AFEES

	Service			
Service	Navy	Air Force	Marines	DoD
Army	.30	.54	.35	.91
Navy		.33	.16	.53
Air Force			.24	.72
Marines				.52

[a]Partially and fully qualified losses are calculated as a proportion of all not disqualified applicants.

Processing applicants. An on-line instantaneous data entry system enables recruiters and their superiors to monitor the status of applicants. For example, both recruiters and their superiors can obtain up-to-date lists of applicants in a partially qualified status.

Substitution of a computer file on each applicant for the cumbersome paper trail that now exists. Since edit routines can be programmed into the system, errors that now occur in the paper files can be reduced. Since information requests can also be programmed into the system, the system can prod recruiters and job counselors to update data elements, such as educational status, that now do not seem to be reliably updated.

Appendix A

CONSTRUCTION OF THE FY77 APPLICANT COHORT FILE

The FY77 Applicant Cohort File is derived from the paper trail that follows each military applicant through the qualification process. The applicant's recruiter initiates the trail, and testers and job counselors at the Armed Forces Examining and Entrance Stations (AFEES) add to it. Once an applicant has test contact with the AFEES or a Mobile Examining Team (MET) site, each transaction with the applicant is entered into the computerized AFEES Reporting System (ARS). The ARS excludes those who only talk with recruiters and those who only take the Armed Services Vocational Aptitude Battery (ASVAB) in high school and have no further test contact with the military services.

The U.S. Military Enlistment Processing Command (MEPCOM), a joint service command, manages both the AFEES and the ARS. MEPCOM takes those data elements common to all services (a 510 byte record for each applicant) and service-unique data elements[1] for the Army, Marine Corps, or Navy[2] (a 180 byte record for each applicant) and submits the file monthly to DMDC. This submission is known as the DMDC EXTRACT.

DMDC compresses the 510 byte record that they receive from MEPCOM on each applicant to an 80 byte record. This extract is known as the MEPCOM EDIT. The MEPCOM EDIT carries all of the personal information on the applicant that appears on the DMDC EXTRACT, such as date of birth and education. The DMDC EXTRACT and the MEPCOM EDIT differ primarily in

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[1] In FY77 MEPCOM did not forward service-unique data to DMDC.
[2] The Air Force does not submit service-unique data.

that the MEPCOM EDIT retains the results of all prior transactions (e.g., mental test results), but details on only the most recent transaction.

The FY77 Applicant Cohort Data File is based on DMDC's MEPCOM EDIT. Rand specified that the Cohort File consist of records on all male and female nonprior service (NPS) applicants for active duty in all services in fiscal year 1977, i.e., between October 1, 1976, and September 30, 1977. Although the file included only FY77 applicants, we asked DMDC to check the MEPCOM EDIT files up through January 1979 to locate any later transactions on FY77 applicants.

They first discovered that the EXTRACT apparently underreported applicant records by about 10 percent. DMDC staff located 72,925 individuals who had entered DEP or active duty in FY77, but had no applicant record for either FY76, the transition quarter, or FY77. The absence of such records meant that DMDC could not construct an accurate base population for the FY77 Applicant Cohort File. Second, they found the number of successful examinees who did not enlist to be three times the number reported by MEPCOM for FY77. DMDC resolved both problems, as described below.

The DMDC staff initially assumed that these two problems were related. Accessions without applicant records and successful examinees without accession records could be the same people. Social security numbers are used to link applicant and accession records, and errors or changes in these numbers between application and accession preclude a match.

DMDC therefore performed a name and birthdate match between the applicant, Delayed Entry Program (DEP), and accession files. The match

linked only 966, or 3.4 percent, of those accession cases that had no applicant record with an applicant record. It linked only 13,839, or 3.5 percent, of those applicant cases without an accession record with an accession record. They also checked the active-duty officer files and selected reserve files to see if partially or fully successful examinees who did not access into the active-duty enlisted forces ended up in the officer corps or in the reserves. They found that 14,816, or 3.8 percent, of all applicant cases without an accession record had entered as officers or enlisted in the reserves.

These checks reduced, but hardly eliminated, the large number of accessions without applicant records or successful examinees without accession records. The DMDC staff, MEPCOM, and Rand concluded that the accession cases probably represented persons who tested and entered DEP or active duty on the same day. In these cases MEPCOM sent DMDC the DEP or accession record, but no applicant record. DMDC checked the consistency between applicant and accession records for members of the FY77 cohort for whom they had both types of records. The two types of records were highly consistent. Any differences between them arose from corrections of the applicant record at the time of DEP or active-duty entry. Thus, DMDC could validly use DEP or accession records to recreate applicant records for individuals without such records. This step produced an accurate base population for the Cohort File.

The large number of successful examinees who did not enlist were of two kinds: fully qualified applicants who did not enlist (QNEs) and applicants who passed the ASVAB and did not complete the qualification process. We concluded that MEPCOM had overreported the number of QNEs. MEPCOM reports QNE numbers by fiscal year. The longitudinal nature of

the FY77 Applicant Cohort File let us follow applicants beyond one fiscal year. We found that 12,495, or 27 percent, of applicants counted as QNEs in FY77 actually accessed in FY78. However, MEPCOM did not report applicants who passed the ASVAB but did not take the medical examination, i.e., partially qualified applicants.

Finally, DMDC purified the Cohort File in two other ways. Using name match techniques, they identified about 4000 duplicate records that had different social security numbers. They also found about 2600 applicant records coded as nonprior service applications that were in fact prior service applicants. They eliminated both duplicate and prior service records from the file.

Table A.1 shows profiles of male FY77 recruiting outcome groups, and Table A.2 gives the same information for females.

Table A.1

PROFILES OF FY77 RECRUITING OUTCOME GROUPS
(DoD Males)

Characteristics	Initial Applicant Pool	Outcomes of Recruiting Process						
		AFQT Failures	PQ Losses	Medical Failures	QNE Losses	DEP Losses	DEP Accessions	Direct Ship Accessions
Mean age (years)	19.1	19.2	19.8	19.9	20.4	18.9	18.8	19.1
Percent minority	30.2	54.7	21.6	23.9	23.7	27.8	27.1	26.9
Mean income for applicants' zip code areas (dollars)	13,738	12,888	13,997	13,802	14,262	13,929	13,815	14,004
Education								
Percent high school nongraduates	40.4	67.9	40.6	39.7	34.3	42.7	30.8	44.4
Percent high school graduates	54.3	30.5	47.3	49.5	50.6	51.7	65.0	52.4
Percent with at least some college	5.5	1.7	12.0	10.9	15.1	6.2	4.3	3.2
Miscalibrated mean AFQT score	49.7	16.3	56.3	56.2	58.1	55.0	55.7	54.2
Renormed mean AFQT score	43.1	11.4	50.1	49.3	52.0	47.9	48.7	46.6
Marital status								
Percent single, with or without dependents	91.0	91.2	88.1	88.3	86.0	91.5	91.9	92.1
Percent married, 0-1 dependent	4.1	3.4	5.1	5.0	5.3	3.8	4.0	3.7
Percent married, 2-9 dependents	4.9	5.4	6.8	6.7	8.7	4.7	4.1	4.2
Type of area								
Percent from large metro core	28.5	30.8	28.3	32.8	36.2	32.6	26.0	32.8
Percent from large metro suburbs	11.0	8.0	10.3	12.3	16.5	11.7	11.4	13.0
Percent from medium metro	24.3	24.4	24.3	24.2	20.8	21.3	25.0	22.0
Percent from small metro	9.7	9.5	10.7	8.6	6.3	8.6	9.8	8.9
Percent from urbanized adjacent	6.7	6.2	7.1	6.3	5.6	6.5	7.0	6.2
Percent from urbanized nonadjacent	4.9	5.0	5.4	4.4	3.1	4.4	4.9	4.3
Percent from less urbanized adjacent	6.1	6.5	5.8	6.9	4.8	6.0	6.4	5.0
Percent from less urbanized nonadjacent	6.4	6.7	5.9	8.1	4.8	5.9	6.7	5.4
Percent from rural adjacent	1.0	1.2	0.8	1.3	0.6	1.0	1.1	0.8
Percent from rural nonadjacent	1.8	1.8	1.5	2.4	1.4	2.0	1.9	1.6

Table A.2

PROFILES OF FY77 RECRUITING OUTCOME GROUPS
(DoD Females)

Characteristics	Initial Applicant Pool	Outcomes of Recruiting Process						
		AFQT Failures	PQ Losses	Medical Failures	QNE Losses	DEP Losses	DEP Accessions	Direct Ship Accessions
Mean age (years)	19.8	19.4	20.2	20.6	20.6	19.6	19.7	20.1
Percent minority	29.9	49.6	20.3	19.1	19.6	15.9	20.8	18.9
Mean income for applicants' zip code areas (dollars)	13,808	13,290	14,045	13,903	14,508	14,222	14,040	14,213
Education								
Percent high school nongraduates	21.0	31.8	19.8	19.6	15.4	21.0	10.6	12.5
Percent high school graduates	67.2	62.2	61.8	60.7	63.0	65.9	78.6	78.4
Percent with at least some college	11.9	6.1	18.3	19.7	21.7	13.0	10.9	9.1
Miscalibrated mean AFQT score	54.4	29.4	63.2	70.7	67.9	70.4	69.5	67.6
Renormed mean AFQT score	49.0	19.8	58.8	68.3	64.7	68.3	67.2	64.8
Marital status								
Percent single, with or without dependents	88.2	89.8	87.7	85.3	86.9	85.8	88.0	85.1
Percent married, 0-1 dependent	7.9	6.7	8.2	10.5	9.3	10.0	8.1	10.1
Percent married, 2-9 dependents	3.9	3.5	4.1	4.2	3.8	4.3	4.0	4.7
Type of area								
Percent from large metro core	25.8	26.9	25.9	23.9	26.6	26.7	23.7	30.0
Percent from large metro suburbs	10.9	9.5	10.5	12.5	17.2	12.9	12.1	12.9
Percent from medium metro	24.8	24.5	25.2	23.9	22.8	24.2	25.1	24.0
Percent from small metro	11.2	11.3	11.7	8.7	9.2	9.7	10.9	10.8
Percent from urbanized adjacent	7.2	6.7	7.7	7.2	7.3	7.4	7.4	7.2
Percent from urbanized nonadjacent	5.2	5.4	5.2	5.2	3.8	4.9	5.2	3.9
Percent from less urbanized adjacent	6.0	6.2	5.7	6.4	5.9	5.0	6.4	5.0
Percent from less urbanized nonadjacent	6.3	6.5	5.8	8.5	4.8	6.4	6.5	4.6
Percent from rural adjacent	0.9	1.1	0.7	1.0	1.0	1.0	1.0	0.6
Percent from rural nonadjacent	1.8	1.9	1.6	2.7	1.5	1.8	1.8	1.2

Appendix B

DEPENDENT AND INDEPENDENT VARIABLES: TECHNICAL ISSUES

DEPENDENT VARIABLES

This appendix discusses characteristics of our dependent and independent variables that affect interpretations of our analysis results. We can only clearly distinguish the fully qualified, partially qualified, and return to recruiter outcomes from each other for February-September 1977. From October 1976 through January 1977, MEPCOM used fully qualified and return to recruiter, but no partially qualified, codes. They introduced a partially qualified code in February 1977, producing a drop in the number of fully qualified cases and almost eliminating the return to recruiter cases. The total number of fully qualified, partially qualified, and return to recruiter losses as a percentage of total accessions did not vary much by month.[1] However, before the partially qualified code was introduced, the fully qualified losses represented 25 percent per month of the combined fully qualified and return to recruiter cases; the return to recruiter cases, 75 percent. After the partially qualified code was introduced, the fully qualifieds dropped to about 8 percent per month of the combined fully qualified, partially qualified, and return to recruiter cases. The return to recruiter cases dropped to 1 or 2 percent of these total cases. Thus, apparently almost all of the return to recruiter cases and about two-thirds of the fully qualified cases in October 1976 through January 1977 were partially qualified losses.

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[1] As a percentage of total applicants, the combined fully qualified, partially qualified, and return to recruiter cases were slightly smaller in October-December 1976 than in January-September 1977, probably because the GI Bill expired in December 1976.

INDEPENDENT VARIABLES

Service and AFEES

In FY77 we had only two identifiers of units with recruiting management responsibilities, the military services and AFEES.[2] Thus, we lacked identifiers of several important recruiting management units: recruiter and higher units whose names vary by service. (For example, in the Army these levels are called the recruiting station, recruiting area, and district recruiting command.) We considered using the AFEES number and the applicant's zip code of home of record to infer management units such as, for example, the Army's district recruiting command and recruiting area. However, although Army district recruiting commands (Navy recruiting districts/Marine Corps recruiting stations/Air Force squadrons) overlap the AFEES system, they do not have a one-to-one match. For example, for the Army, both the Los Angeles and Santa Ana District Recruiting Commands use the Los Angeles AFEES. With regard to the applicant's zip code of home of record, we found that applicants often do not apply to the military management unit for their zip code.

Race and Ethnicity

The race variable is fairly reliable and valid. The ethnicity variable is a self-report measure and valid as a measure of the group with which the applicant identifies. It is less valid as a measure of the social origins of the individual.

[2] As of August 1981, the DMDC EXTRACT contains the recruiter identifier for each applicant who tests. The Air Force recruiter identifier also contains identifiers for all recruiting management levels. However, for the Army, Navy, and Marine Corps identifiers of the service's different recruiting management levels (e.g., district recruiting command) do not enter the ARS until the applicant signs a contract. For the Marine Corps and Navy the counterparts of the Army's recruiting station are not coded even at this point.

Educational Attainment

In its educational attainment codes, the FY77 DMDC EXTRACT did not distinguish high school dropouts from high school seniors, i.e., nongraduates still in school. It now makes this distinction. As we discuss in the text, some anomalies in the data seem attributable to this merging of two very different applicant populations in the high school nongraduate category.

Marital and Dependency Status

The interpretation of the ARS code for "married with one dependent" is ambiguous since it mixes a married couple without children (the spouse being counted as a dependent) with a married couple with one child.

Income of Home of Record

DMDC used Rand data on 1976 average annual income estimates for at least 95 percent of the nation's zip code areas to estimate the annual income of each applicant's home of record. Although others have used this variable to measure social representativeness of enlistees (e.g., Cooper, 1977), results for this variable have to be interpreted very carefully.

First, for any specific applicant we do not know if the applicant's home of record is that of the applicant's parents or of the applicant. The average income of zip code areas for applicants who have left home will be positively correlated with the average income of their parents' zip code areas. However, there should be less variability in the average income of zip code areas inhabited by applicants who have left

home than in the average income of their parents' zip code areas. (Youth have less differentiated incomes than the parental generation.) Thus, if the applicant's zip code represents the applicant's, not his or her parents' residence, the zip code is not necessarily a very good indicator of parental income.

Second, zip code areas differ in their income variance. The average income for zip code areas with a narrow range of incomes is more likely to be a good estimate of the applicant's income (whether his parents' or his own) than the average income for zip code areas with a wide range of incomes.

Third, even if the average income of a zip code area is a good measure of the applicant's parental income, parental income is only a partial measure of parental socioeconomic status. It should be supplemented by data on the applicant's father's occupation or mother's or father's educational attainment. These data are not now recorded for applicants.

Type of Area and Economic Subregion

The USAREC EDIT has a measure of Census region, but this variable reflects political boundaries, and we had not expected it to predict variation in applicant outcomes. DMDC's analyses with this variable confirmed our expectation. However, we still wanted to measure the variation in social and economic opportunities and attitudes associated with a person's residence.

Using the applicant's zip code of home of record, we created two multi-category variables for this purpose: type of area and economic subregion.[3] The type of area variable measures the population size

[3] For further details on both, see McCarthy and Morrison (1979).

and degree of urban influence in the applicant's county of residence and, by inference, the range of economic and social opportunities to residents of that county. For applicants residing in the less urbanized (nonmetropolitan) counties, it also measures whether the applicant's county is adjacent to a metropolitan (densely populated) area.

The economic subregion variable (Fig. 2) groups economically and culturally homogeneous counties. Before analyzing the data, we did not know how much the type of area variable would capture the information contained in this variable.

Miscalibrated and Renormed AFQT Scores

We asked DMDC to include on the FY77 Applicant Cohort File both miscalibrated and renormed scores on the Armed Forces Qualification Test (AFQT). AFQT scores are a composite of scores on certain subtests of the Armed Services Vocational Aptitude Battery (ASVAB). The ASVAB norms in use from January 1976 through September 1980 were miscalibrated, particularly inflating the AFQT scores of lower AFQT FY77 applicants. To analyze the numeric consequences of service AFQT standards (Sec. II), we used the misnormed AFQT scores, i.e., the scores that FY77 norming standards indicated that applicants had. To assess the degree to which applicants with different recruiting outcomes had the same personal characteristics (Sec. III), we needed an unbiased measure of verbal and mathematical achievement. For these analyses we used the renormed scores.

Aptitude Variables

The aptitude variables are also based on ASVAB subtests. Applicant scores on the aptitude variables determine for some services their enlistment eligibility. They also determine their eligibility for different military jobs. The ASVAB has 13 subtests, one of which has four scales. In FY77 the Army and Marine Corps used all subtests to create 10 composite aptitude variables; the Navy used 12 subtests without creating composite variables; the Air Force used 9 subtests to create four composite variables. For example, the Air Force had a mechanical aptitude composite that consisted of the applicant's scores on three subtests: mechanical comprehension, automotive information, and shop information.

We used a mean of the sum of aptitude scores for each individual in our discriminant analyses. These were composite aptitude scores for the Army, Marine Corps, and Air Force and subtest scores for the Navy. There was substantial and fairly equal redundancy of information among the set of aptitudes. Factor analyses of the composite aptitude scores for each service produced one strong factor for the Army, Air Force, and Marine Corps that accounted for 73 to 84 percent of the variance, depending on the service. For the Navy two factors emerged, accounting for 52 percent of the variance for the females and 63 percent for the males. For both sexes and all services the aptitude variables loaded quite evenly on the factors.

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