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ESTIMATES OF AVAILABLE APTITUDE AS A CONSEQUENCE OF DEMOGRAPHIC CHANGE

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The effects of demographic trends on aptitudes of service eligible youth were estimated for the years 1980 through 2010. Census estimates of subpopulation dynamics were used to project the number of available youth in the prime ages for military service. Aptitude was measured using the Armed Services Vocational Aptitude Battery (ASVAB). Two trends emerged. First, the absolute number of enlistment eligible youth decreases from 1980 to a nadir in 1995, and although it climbs slowly after 1995, it remains below the 1980 cohort size through 2010. Second, each of the measures of aptitude shows an average decline through 2010. Such changes have the potential to affect Air Force recruiting and training policy.

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PREFACE

This research was conducted under work unit 77191867 to improve enlisted selection and classification. The impact of changing demographic trends in American society is of paramount importance to manpower planners who make the policy decisions which must accompany changes in the pool of those eligible to enlist. The data presented are meant to be a general guide to the possible future of the Air Force as the population changes make their presence felt.

"You don't need a weatherman to know which way the wind blows."

— American philosopher R. Zimmerman

ESTIMATES OF AVAILABLE APTITUDE AS A CONSEQUENCE OF DEMOGRAPHIC CHANGE

INTRODUCTION

The changing American population will affect the military as well as other segments of the economy. The post-war baby boom of the late 1940s, 1950s, and 1960s created large cohorts of the proper age for enlistment and commissioning. The all-volunteer force of the 1970s was fueled by this large group of young people, but that is already changing.

The future holds few certainties, but among these is that the population cohort of 18 to 23-year-old eligibles for the service has begun to decrease and will continue to do so for the next few years. By the middle of the 1990s, this cohort will begin to slowly expand. This change will have profound consequences to the military. These consequences will be spread across the entire array of manpower, personnel and training activities. Recruiting, selection, job classification, and retention will be impacted as the population changes and policies are adjusted to the available manpower supply. Estimates of aptitude distributions, which can be expected to change as the demographics of the population change, are provided through a series of analyses conducted on a nationally representative sample of American youth.

METHOD

Subjects

A nationally representative sample of American youth, collected in the summer-fall of 1980 by the National Opinion Research Center (NORC), was the sample which formed the basis for these analyses. This sample serves as the normative reference for the scores for the Armed Services Vocational Aptitude Battery (ASVAB). The sample has 9,173 males and females and in weighted form, has over 25,000,000 subjects (Maier & Sims, 1986).

Measures

The ASVAB is a multiple aptitude test battery (Department of Defense, 1984) composed of 10 subtests as shown in Table 1. Except for the Numerical Operations and Coding Speed subtests, all are power tests. The ASVAB is used by all the Armed Services for enlistment qualification and initial job assignment. It is normed on a weighted nationally representative sample of 18- to 23-year-old youths (Maier & Sims, 1986; Wegner & Ree, 1985). The battery has been used in the current configuration of subtests and items since 1980, and is highly reliable (Palmer, Hartke, Ree, Welsh, & Valentine, 1988) and valid (Wilbourn, Valentine, & Ree, 1984). Five measures calculated from the ASVAB are of special interest to the United States Air Force (USAF). The first aptitude index, the Armed Forces Qualification Test (AFQT), is used by Congress to determine relative trainability and quality of recruits for all the services. The other four aptitude indexes are used by the USAF for classification to jobs. Their names and composition are shown in Table 2.

Table 1. Subtests of the ASVAB

Subtest	Number of Items	Time
General Science (GS)	25	11
Arithmetic Reasoning (AR)	30	36
Word Knowledge (WK)	35	11
Paragraph Comprehension (PC)	15	13
Numerical Operations (NO)	50	3
Coding Speed (CS)	84	7
Auto and Shop Information (AS)	25	11
Mathematics Knowledge (MK)	25	24
Mechanical Comprehension (MC)	25	19
Electronics Information (EI)	20	9

Table 2. Air Force Aptitude Indexes

Composite	ASVAB Subtests Included
AFQT	2(WK+PC)+AR+MK
Mechanical (M)	MC+GS+2AS
Administrative (A)	WK+PC+NO+CS
General (G)	WK+PC+AR
Electronics (E)	GS+AR+MK+EI

Procedures

The weights for the sample (which make it nationally representative) correct for oversampling of ethnic minorities and poor white subjects. Adjustments to these weights were derived from current census estimates and projections (Spencer, 1986; Spencer, 1989) for the years 1990 through 2010. Two simplifying assumptions were necessary. The first simplifying assumption was that the Mid-Series estimate provided by the census was most appropriate. In census projections there are three estimates of population on the basis of high, middle and low levels of fertility. The mid-series estimate was used to avoid extremes. Secondly, we assumed that within each of the three racial/ethnic groupings the ability distributions in the future would remain as in 1980. Another way of saying this is that offspring within a group are expected to resemble the group. No assumptions of genetic inheritance nor environmental influence on test scores are necessary.

There were difficulties in the estimation of statistics for Hispanic population groups. The NORC estimates appear to be based on a definition of Hispanic that was different from the estimates used by the Bureau of the Census. The NORC estimate was that there were 1,544,000 Hispanic youth aged 18- through 23-years-old in 1980. Assuming that deaths approximately equaled net migration for this age cohort, there would be 1.544,000 Hispanic youth 20 through 25 years of age (adhering to the NORC definition) in 1982 (the estimate closest to 1980 in the most recent Hispanic census report). The Hispanic census provides a 1982 estimate of 2,026,000 for "Spanish-Origin" or Hispanic residents of this age group. A

multiplier of .767 adjusts 2,026,000 to the NORC value of 1,544,000 and was applied to the census "Spanish-Origin" estimates for 1990, 1995, 2000, 2005, and 2010.

Additionally, net increases from emigration/immigration and the effects of the out-marriage rate (the rate at which members of one group marry or produce children with members of another group) could not be appropriately estimated. We believed these effects would be small because noncitizens are a negligible portion of the USAF and out-marriage rates tend to cancel across groups.

Distributions of AFQT categories were made. The number and proportion in each category was computed for each year. Additionally, the mean, standard deviation, and selected percentiles were comput d for the USAF aptitude indexes: Mechanical, Administrative, General, and Electronics.

RESULTS AND DISCUSSION

The proportions of racial/ethnic groups in 1980 through 2010 are shown in Table 3. The white proportion of the population falls from 80% to 74% during the period.

Table 3. Racial/Ethnic Percentages of 18- to 23-Year-Old Population

Year	White	Black	Hispanic
1980	80.3	13.7	6.1
1990	78.3	14.6	7.0
1995	76.5	15.4	8.1
2000	76.0	15.7	8.4
2005	74.9	15.7	9.4
2010	73.8	16.0	10.2
1980-2010	-6.5	+2.3	+4.1

Year	Total	White Numbers (x1000)	Black	Hispanic
1980	25,409	20,395	3,470	1,544
1990	22,309	17,478	3,266	1,565
1995	20,399	15,608	3,141	1,650
2000	21,900	16,642	3,429	1,829
2005	23,132	17,336	3,630	2,166
2010	23,265	17,172	3,720	2,373

The Black and Hispanic proportions in this age-range increase from approximately 14% to 16% and 6% to 10% respectively. Table 3 also shows the estimated number of people in these subgroups. The most apparent effect is the consequence of the reduction of number of births--the birth dearth as it has been called in the popular press. The number of military aged young men and women falls by about 3.1 million from 1980 to 1990. In 1995 the number falls further to show a decrement of about 5 million compared to 1980. From 2000 to 2010 the numbers increase but remain 2.1 million fewer than in 1980.

Table 4 shows the distribution of AFQT category by year. Category II, from which the USAF heavily recruits, shows the largest change in proportion.

Table 4. Distributions of AFQT by Category

AFQT Category	%	1980	1990	1995	2000	2005	2010
I	93-99	7.9	7.8	7.6	7.6	7.5	7.4
II	65-92	28.2	27.7	27.3	27.2	27.0	26.7
III	31-64	33.6	33.4	33.2	33.1	33.0	32.9
IV	10-30	21.0	21.4	21.8	21.9	22.1	22.3
V	1-9	9.3	9.7	10.1	10.2	10.4	10.7
I-IIIa	50-99	51.4	50.6	49.9	49.7	49.3	48.9
IIIb-V	1-49	48.6	49.4	50.1	50.3	50.7	51.1

Estimated Number of Manpower Resources (x1000)

		1980	1990	1995	2000	2005	2010
I		2,007	1,740	1,550	1,664	1,734	1,721
II		7,165	6,179	5,568	5,956	6,245	6,211
III		8,537	7,451	6,772	7,248	7,633	7,654
IV		5,335	4,774	4,446	4,796	5,112	5,188
V		2,363	2,163	2,060	2,233	2,405	2,489
I-IIIa		13,060	11,288	10,179	10,884	11,404	11,376
IIIb-V		12,348	11,020	10,219	11,015	11,727	11,888

Note. % is used to indicate percentile.

From 1980 to 1995 there is a loss of over one and one-half million. Category I shows a loss of 450,000 in this same period. Categories IV and V show increased proportions but a loss of 1,200,000 young men and women from 1980 to 1995. However, these two lowest categories climb steadily to 1980 levels by the end of 2010. The United States Air Force does no significant recruiting in Category IV and is prohibited from recruiting in Category V. The proportion in the upper half of the distribution (I-IIIa) decreases from 51.4% to 48.9% across the time span estimated.

Finally, Table 5 gives the expected proportions of the population in the four quartiles for 18- to 23-year-old youth for the four USAF aptitude index composites. Changes in the demographics lead to projections of decreased performance on these classification measures for enlistment age youth through the year 2010.

By the year 2010, the United States Air Force could be much different from now. The proportion of whites in the applicant population will decrease and the proportion of minority group members will have increased. A little over a quarter (26.2%) of the pool of eligibles will be Black or Hispanic as opposed to about 19% in 1980. The absolute number of young men and women in the prime recruiting ages will have fallen from the large 1980 value to its lowest in 1995. The number then begins a 15-year climb but will still be more than 2 million below the level of 1980. In the AFQT I-IIIa categories, there will be over 1.6 million fewer young people than in 1980. The United States Air Force and the other services are currently

concentrating their recruiting in these categories and competition can be expected to become more intense. Because almost all United States Air Force officers come from AFQT categories I and II where there will be about 1.2 million fewer in 1995 than in 1980, the recruitment of officers can be expected to become more competitive and difficult.

Table 5. Distribution of USAF Aptitude Index Percentile Scores

Mechanical	1980	1990	1995	2000	2005	2010
Mean	50.3	49.7	49.2	49.0	48.8	48.4
Std Deviation	28.8	28.9	29.0	29.0	29.1	29.1
First Quartile	26.1	24.6	24.1	24.0	23.8	23.6
Second Quartile	24.3	24.4	24.2	24.1	23.9	23.7
Third Quartile	24.8	25.0	24.9	24.8	24.8	24.8
Fourth Quartile	24.8	26.0	26.8	27.1	27.5	27.9
Administrative	**1980**	**1990**	**1995**	**2000**	**2005**	**2010**
Mean	50.6	50.1	49.6	49.5	49.2	48.9
Std Deviation	29.0	29.1	29.1	29.2	29.2	29.2
First Quartile	26.1	25.7	25.3	25.2	24.9	24.7
Second Quartile	24.3	24.0	23.7	23.6	23.6	23.4
Third Quartile	24.8	24.7	24.8	24.8	24.7	24.8
Fourth Quartile	24.8	25.6	26.2	26.4	26.8	27.1
General	**1980**	**1990**	**1995**	**2000**	**2005**	**2010**
Mean	51.0	50.4	49.9	49.7	49.4	49.1
Std Deviation	29.1	29.3	29.3	29.4	29.4	29.4
First Quartile	26.6	26.1	25.7	25.5	25.3	25.0
Second Quartile	24.0	23.7	23.4	23.4	23.2	23.1
Third Quartile	24.8	24.7	24.7	24.7	24.7	24.7
Fourth Quartile	24.6	25.5	26.2	26.4	26.8	27.2
Electronic	**1980**	**1990**	**1995**	**2000**	**2005**	**2010**
Mean	50.3	49.8	49.3	49.1	48.8	48.5
Std Deviation	28.8	28.9	29.0	29.0	29.1	29.1
First Quartile	25.0	24.6	24.2	24.1	23.8	23.6
Second Quartile	24.5	24.1	23./	23.6	23.6	23.3
Third Quartile	25.3	25.3	25.3	25.3	25.2	25.2
Fourth Quartile	25.2	26.0	26.8	27.0	27.4	27.9

Note. "Std" is the symbol for standard.

The four United States Air Force composites show a decline in average percentile score. In each case the proportion of scores in the two upper quartiles decline while the two lower quartiles increase. The implication is that it will be more difficult to recruit and train individuals for the more difficult technical specialties. For example, the proportion in the first quartile of the Electronics composite drops to 23.6%. This is a drop of over 861,000 young men and women who qualify for training in USAF jobs requiring first quartile electronics aptitude. Additionally, industry can be expected to bid for the services of the highly qualified. The

demographic trends suggest that recruitment for the USAF will become somewhat more difficult. Because aptitude is closely related to training, job performance, retention, promotion, and a host of other areas which concern the USAF, the policies of today must be modified to accommodate the changes in the population.

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