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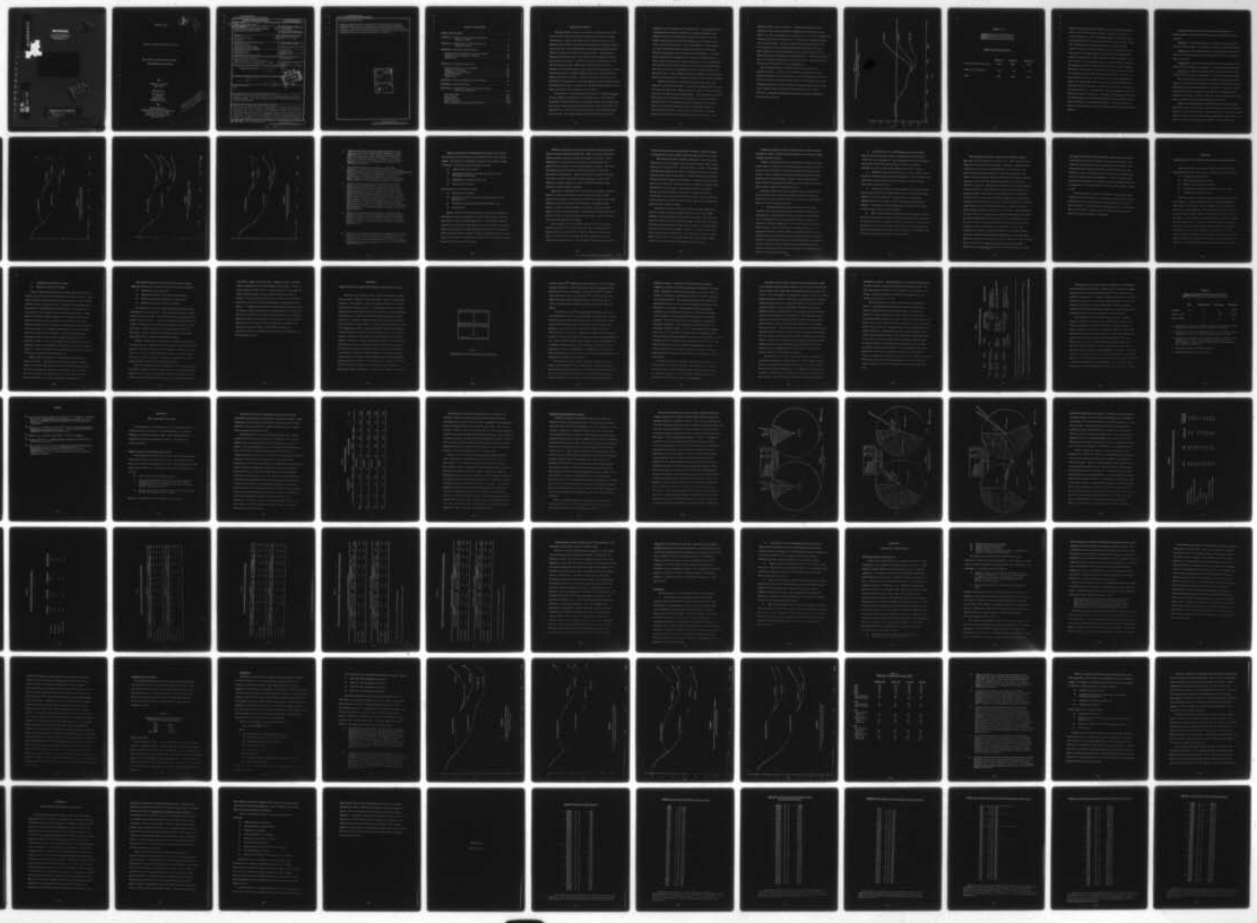

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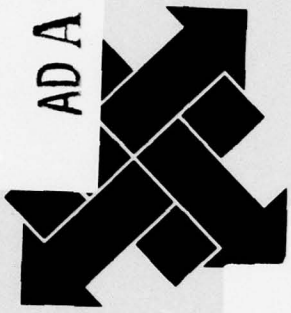

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DOD AND NAVY MANPOWER SUPPLY SCENARIOS THROUGH 2000

By:

David W. Grissmer
Kwan Kim

Submitted to:

Mr. Irv Schiff
OP-964
The Pentagon
Washington, D.C.

By:

MATHTECH, Inc.
A Subsidiary of MATHEMATICA, Inc.
4630 Montgomery Avenue
Bethesda, Maryland 20014
(301) 657-1610

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emphasized that what was produced was not a projection of what will probably happen, but only an estimate of a range of possible manpower scenarios. The results show that declines in high quality enlistments due to population decline and economic conditions could lend to severe manpower shortfalls if present manpower policies were not altered.

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EXECUTIVE SUMMARY

The all-volunteer Armed Forces has been a reality for over 3 years. In 1973 when the draft was ended, the outlook for the volunteer concept was uncertain. However, the experience over the last three years has generally been favorable with all services meeting their manpower requirements each year. The overall quality of personnel enlisting also generally compares favorably with experience during the draft. As measured by Diploma High School Graduates, the quality of DOD enlistments is higher than during the draft years. The Marine Corps has fared the worst under the all-volunteer concept. While other services were able to attract volunteers of the desired quality to make up for the missing draftee and draft motivated personnel, the Marine Corps has had difficulty maintaining the quality of enlistees they desire. They have, however, been able to meet quantitative recruiting goals by accepting additional non-high school graduate and category IV personnel. However, new stringent quality standards for the Marine Corps may cause shortfalls in the near future.

The experience of the last three years, however, is probably atypical of what is likely to be experienced in the next 25 years. The outlook for maintaining an all-volunteer force over that time span is bleak without some fairly major changes in military manpower policies during that period. The years of FY 76, 77 and 78 are likely to be the peak years for high quality male enlistees. The supply of higher quality male enlistees is likely to

experience a severe decline over the next 25 years. The magnitude of the decline depends on several assumptions concerning unemployment and population, however, the largest percentage decline shown by current models using conservative planning assumptions shows declines of up to 40 per cent from current levels in the 1990-2000 period. This estimate of a 40 per cent decline probably represents a lower limit to possible declines in high quality enlistees during the 1975-2000 period. It is made using assumptions of continuing low birth rates, low unemployment and using a model which attributes a strong unemployment effect on enlistments. Actual declines will be less than 40 per cent during most of the period and may not reach this level if unemployment rates are high or if birth rates again start rising. Under conditions of higher unemployment and birth rates rising to replacement levels, maximum declines of 18 per cent are estimated.

This potential decline is primarily due to two factors which will change the recruiting environment. The first is the population decline in the 17-21 year old male group. Population estimates show 1978 to be the peak year with 10.8 million males in the population. This group will then decline until at least 1991 when it will reach 8.8 million, a 19 per cent decline. Projections after 1991 depend on birth rate assumptions, but if current birth rates continue, the population in this age group will continue to decline until around 1995. At that time the "second wave" baby boom will hit and population in this group will likely start rising again. The

population effect is shown in Figure 1. The three estimates after 1991 represent current Census Department assumptions concerning birth rates. Series I, II, and III correspond to birth rates of 2.7, 2.1, and 1.7 respectively. Currently birth rates are running at 1.8 so the Series I assumption appears to be overly optimistic. Table S.1 compares the present population in the 17-21 year group to the lowest projected population in the next 25 years. Under optimistic birth rate assumptions, the low point will occur in 1992 when the population is 82 percent of current population. Under the pessimistic birth rate assumption population will hit the low point in 1995 when it will hit 75 percent of the current 17-21 year old population.

The second factor likely to change the recruiting outlook is the unemployment rate. A return to more traditional unemployment levels will mean a decline in service enlistments. Service enlistments in the 1974-1977 time period have been appreciably swelled by high unemployment rates. Unemployment rates for 16-21 year old out of school youths have risen from a low of around 10 per cent in 1973 to a high level of 17.5 per cent in 1975-1976. Recently unemployment rates for this group have declined to the 15-16 per cent range.

Figure 5.1
Percent Change from 1976 in Annual Estimates and Projections of
17 - 21 Year Old Male Population

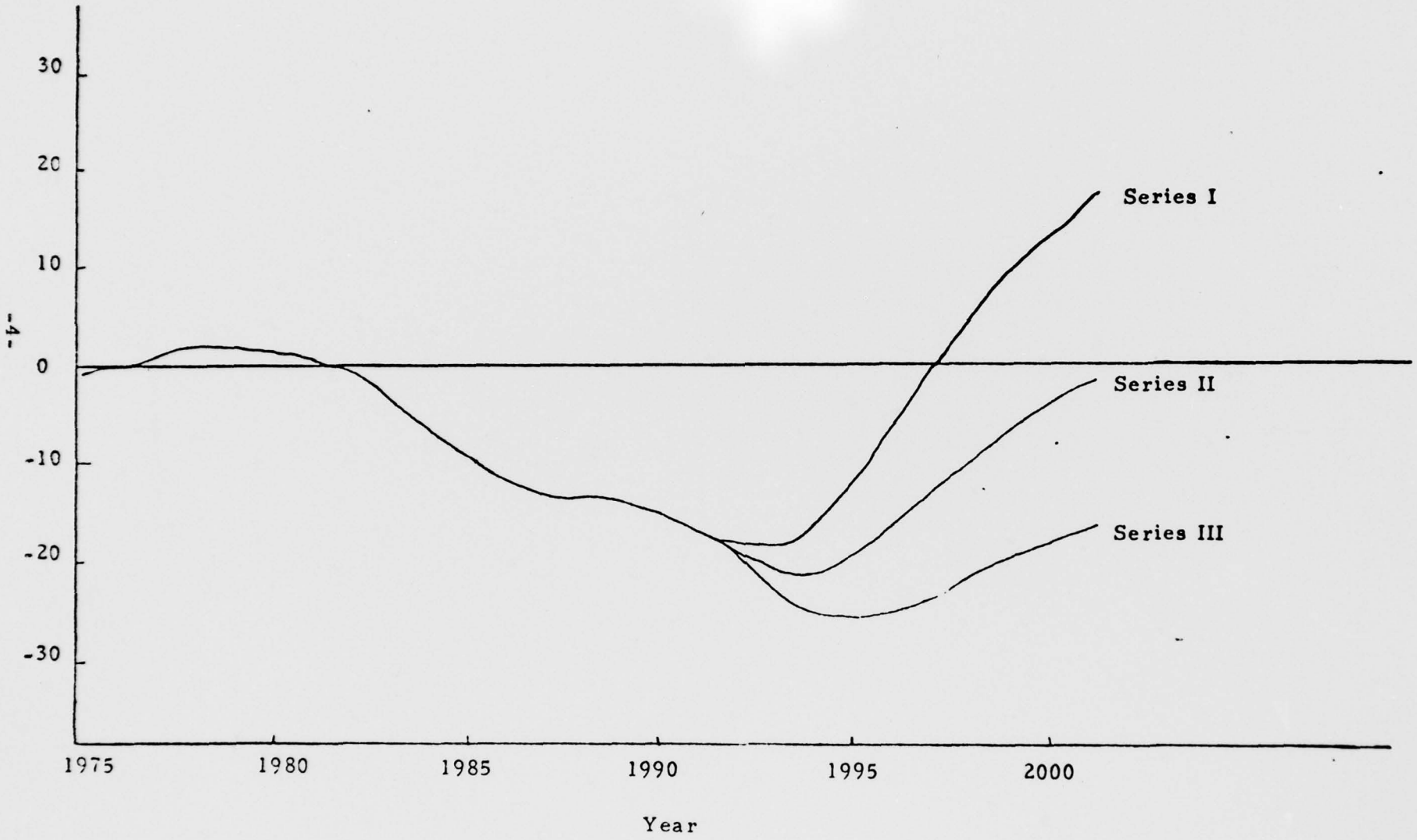

TABLE S.1

Comparison of 17-21 Year Old Male Population Projections for Lowest Population Year in 1976-2001 Period

Lowest Population in Period

	Series I	Series II	Series III
17-21 Male Population (000)	8706	8417	7935
Ratio to 1976 Population	.82	.79	.75
Year	1992	1993	1995

Based on recent econometric modelling, a return to the unemployment levels of 1971-1973 will mean a decline of roughly 10-35 percent in service enlistments. With a new administration coming to power with a strong commitment to lowering unemployment, declines appear likely. The combined effect of lower unemployment rates and population decline can combine to severely change the current recruiting picture. Forecasting of enlistment supply has been done in this report based on equations developed on the basis of enlisted volunteer experience in the 1970-76 period. These equations show the rates of military/civilian pay and unemployment to be important determinants of enlistment supply in this period. However this model is a fairly simplified model which does not contain many factors which might affect enlistments in the long run. Thus additional research is necessary to develop more comprehensive models of the youth labor market. Also, this model has two differences with other models reviewed here which make its projections conservative for planning purposes. It assumes that a decline in population will be proportional to decline in enlistments. Secondly, the unemployment elasticity is somewhat higher than the other models thus showing a somewhat larger drop in enlistments as unemployment declines. For these reasons, the projection should probably be viewed as lower limits to possible enlistment declines.

Projections of Navy and all services male enlistees who are Mental Category I-III high school graduates have been made under four scenarios:

Scenario I - Youth unemployment rates remain at the peak levels of 1974-1976 and fertility rates approach 1.7 (Series III Census Projection)

Scenario II- Youth unemployment rates remain at the peak levels of 1974-1976 and fertility rates approach replacement level of 2.1 (Series II Census Projection)

Scenario III - Youth unemployment rates remain at the lowest level of 1971-1974 and fertility rates approach 1.7 (Series III Census Projection)

Scenario IV - Youth unemployment rates remain at the lowest level of 1971-1974 and fertility rates approach 2.1 (Series II Census Projection)

The assumption has been made that military and civilian pay remain at parity with respect to each other over this period. Over the last 2 years, military pay has declined at roughly 2 per cent per year relative to civilian wages due to pay caps. However over the long term, rough parity will probably be maintained. If military wages do decline with respect to civilian wages, enlistment declines would be greater than projected.

Figure S.2 shows projections of DOD CAT I-II high school graduate enlistments under the 4 scenarios. The projections are made as the ratio of enlistments in the projection year to enlistments in 1976. From 1976 to 1980 a single projection is shown corresponding to population changes and unemployment declines currently projected by OMB. For 1985-2000, two

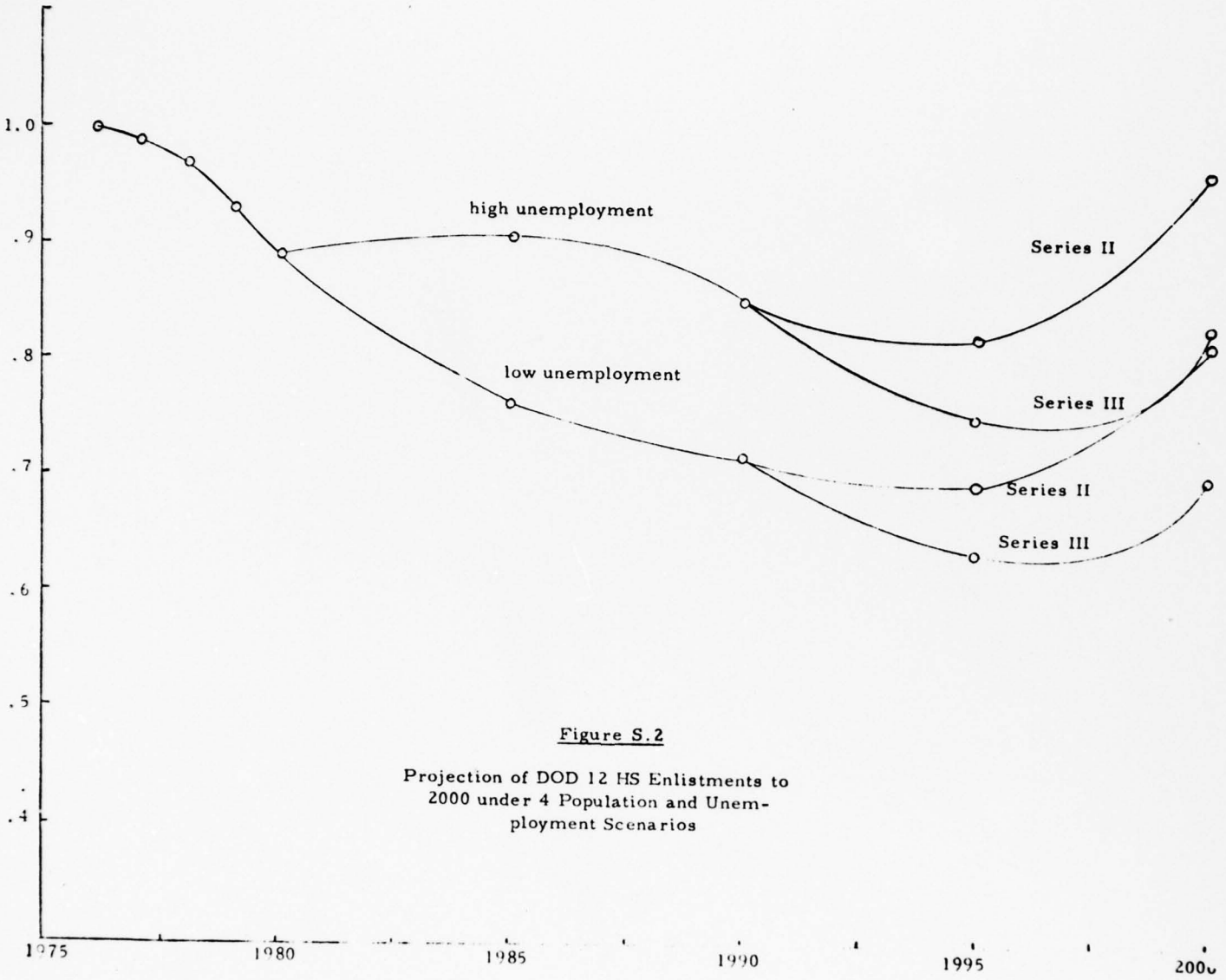

Figure S.2

Projection of DOD 12 HS Enlistments to 2000 under 4 Population and Unemployment Scenarios

employment scenarios are projected corresponding to the low and high unemployment rates reached in the 1970-76 period. After 1990, two population scenarios are given corresponding to two different fertility assumptions. Series II assumes an ultimate fertility rate at replacement level of 2.1 lifetime both per woman, while Series III assumes a fertility rate of 1.7 lifetime births per woman. These assumptions are not important until 1990-1995 since births have already occurred for the 17-21 year old population through 1993. Projections are also given in Figures S.3-5 for DOD CAT III HS, Navy CAT I-II HS and Navy CAT III HS enlistees.

The projections show several interesting trends...

- If unemployment rates continue to decline in the 1976-1980 period, and unemployment rates oscillate between traditional high and low levels in the 1977-2000 time period, then the period of maximum quality enlistments in the 1975-2000 time period will be 1976-1977. The quality of enlistments during 1976-1977 has been better than during the draft period, so there is some room for declining quality and still remaining in the region of historical quality rates. As far as the volunteer force is concerned however, the peak of the quality of male enlistees is probably now.

- This projection model shows that high quality enlistments could dip by almost 40 percent in the 1995 time frame provided unemployment rates are low and Series III population projections are accurate (fertility rate of 1.7). The maximum drop predicted by this model is greater than would be shown by other enlistment models reviewed here, and should probably be considered as a conservative or low level limit estimate for planning purposes.

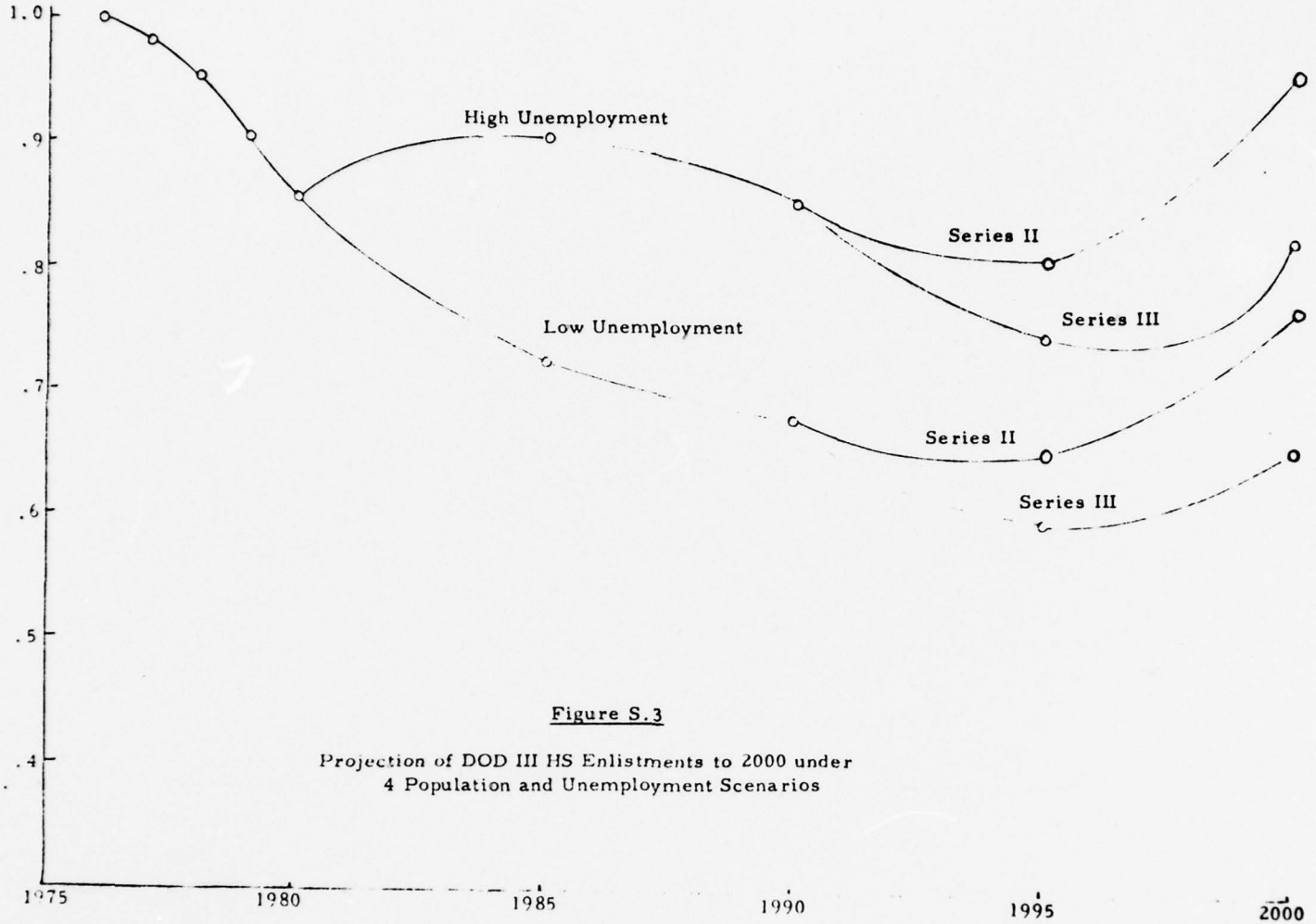

Figure S.3

Projection of DOD III HS Enlistments to 2000 under
4 Population and Unemployment Scenarios

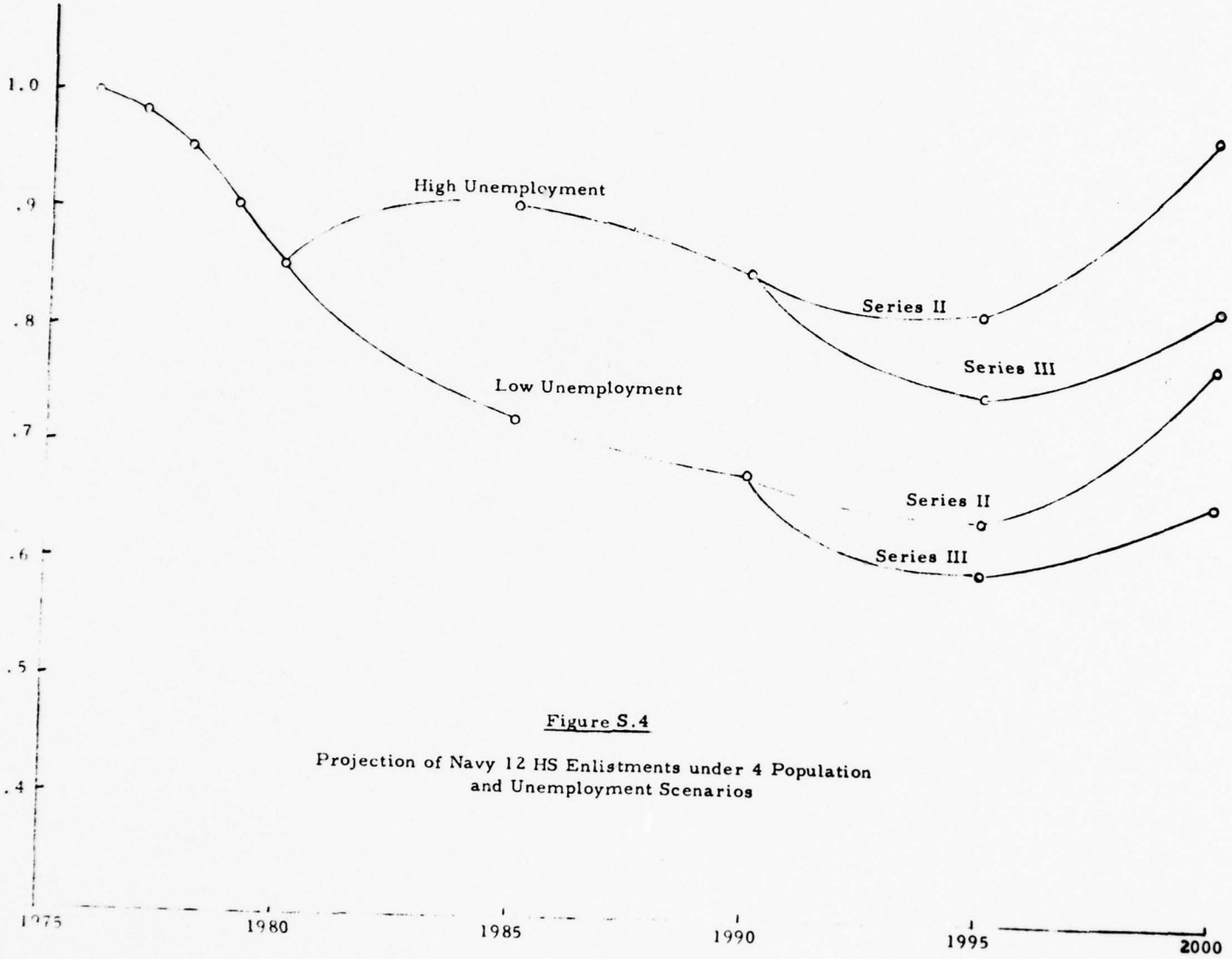

Figure S.4

Projection of Navy 12 HS Enlistments under 4 Population and Unemployment Scenarios

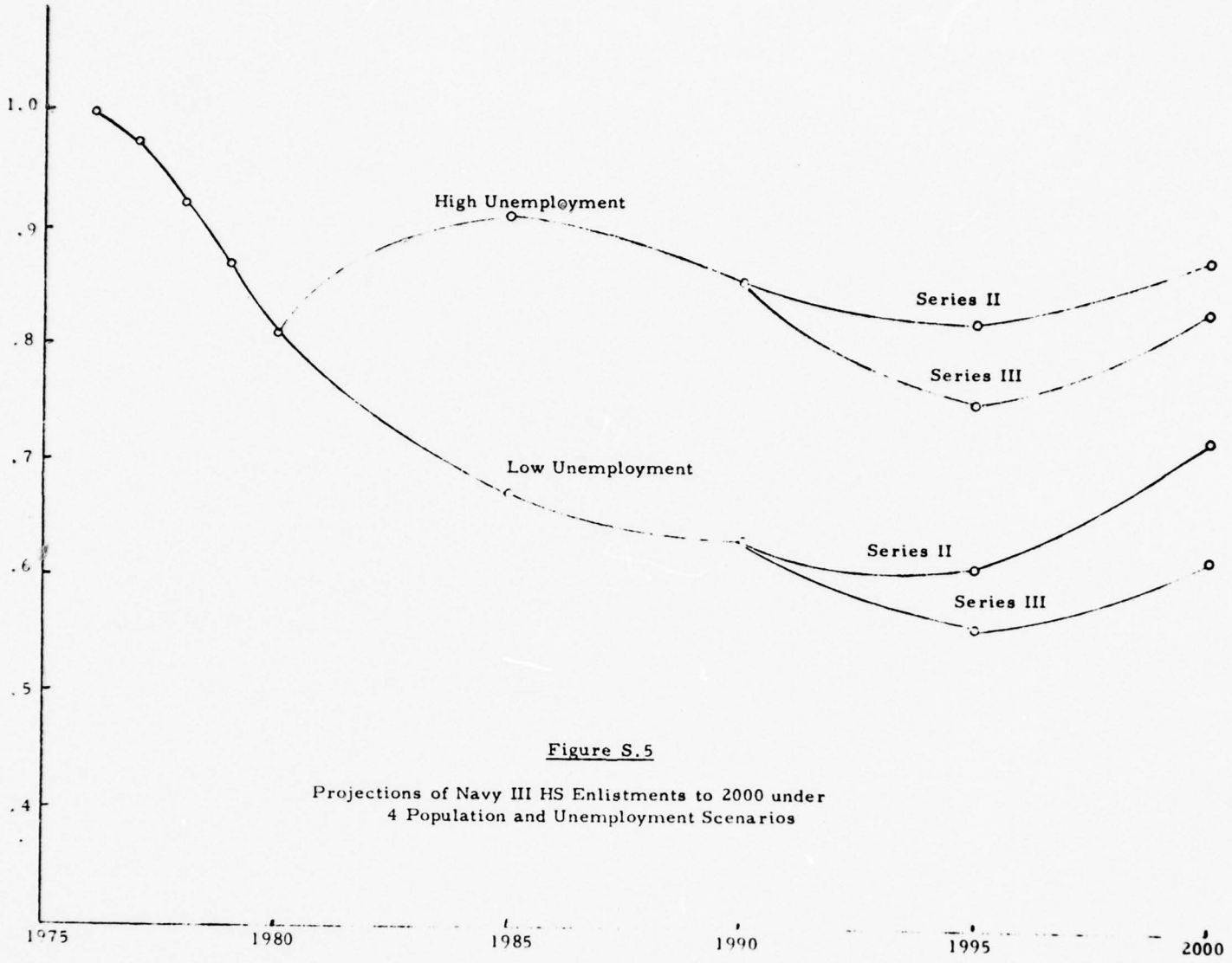

Figure S.5

Projections of Navy III HS Enlistments to 2000 under
4 Population and Unemployment Scenarios

- Under all projections, the most vulnerable period for the volunteer force will be periods of low unemployment in the 1985-2000 time frame. Even under pessimistic population projection, population begins to rise again in 1995-2000 due to a second wave baby boom, and under more optimistic population assumptions the population rises rapidly in the 1995-2000 time frame.

- If unemployment declines according to current OMB projections, and if the historical relationship exists between general unemployment and youth unemployment, then the model shows CAT I-III HS enlistments for DOD and the Navy will decline by 1980 by 13 to 17 percent. This decline would bring quality indicators to more historical levels for the Navy and DOD. Declines of this magnitude are probably manageable.

- Periods of low youth unemployment during the 1982-1990 time frame will probably bring serious reappraisal of the volunteer force under current military manpower policies. This is partly due to the fact that shortfalls in high quality enlistments will fall unevenly in the services with the Army and Marine Corps probably feeling the effects first. At such time, manpower planners would be looking at least at a 5-15 year period of continually declining population. A return to the draft would look like an attractive option to many at this time. Universal service would also look more attractive than now as the population and the costs would fall in the 1985-1995 period. These options seem reasonable enough to include in long-range planning options.

- Should youth unemployment rates remain at relatively high historical levels due to the competition from the more populous and better trained 21-35 year old group during the 1985-2000 period, the largest estimated percentage decline in high quality enlistments would be 18 percent using Series II and 25 percent using Series III.

- The Navy is more affected by changes in unemployment than DOD enlistments as a whole. The Navy could experience wide swings in quality during the 1977-2000 period if unemployment rates oscillate between levels encountered in 1970-76. Sets of counter cyclical military manpower policies will probably be necessary to smooth quality input.

What are the options for sustaining an all-volunteer force in the face of possible serious declines in the traditional 17-21 year old male supply? The options can be grouped according to their effect on supply or demand. On the demand side, the options include:

1) smaller active force levels,

2) restructuring the force to require less accessions by increasing reenlistments,

3) substitution of capital for labor, and

4) civilianization of billets.

On the supply side, the options include:

1) increased use of women,

2) increased use of men in other age groups, prior service personnel, etc.,

3) relaxation of physical and/or mental standards, and

4) increased pay.

Smaller active force levels would of course arise from reduction in international tension, or reduction in overseas commitments. However, other options exist for smaller active forces. These include increased reliance on reserves and civilianizations of active force billets. Continued pursuit of the total force concept could bring active force level reductions while maintaining military strength. Civilian substitution has been ongoing since the start of the all-volunteer force and further active force reductions through civilianization may be possible.

Accession requirements could also be reduced by reducing personnel turnover through increased reenlistments. This, of course, would mean slower promotion rates and a greater percentage of careerists. Some enlisted men for instance may have to stay at a grade level for long periods of time, similar to some civilian manpower systems. The "up or out" policy basically would have to be changed to allow an increased percentage of reenlistments. However, cost/benefit tradeoffs would need to be made taking into account the increased retirement costs of this approach. However, higher force levels could be maintained at lower accession levels through this approach.

Substitution of capital for labor includes design of weapons systems, logistics systems and management systems requiring less personnel. However this reduction in personnel may be offset by requiring more highly skilled personnel where supply is more limited. More highly capital intensive systems, while demanding less personnel, may also demand higher technical levels of competence. Since the higher qualified personnel are more costly to recruit and may be in short supply, a more comprehensive look at this approach is necessary.

On the supply side, the percentage of women in the services was around 2 percent in FY 71. The services now take in around 8 percent women in their accessions in FY 76 - FY 77. With greater experience in the use of women for traditionally male roles, this may be a viable option for maintaining the force. The number of women currently wanting

to enter is greater than the requirements. However, no good estimates are available for the total supply available if requirements were raised.

The traditional method of meeting requirements when high quality personnel are in short supply is to lower mental standards and to accept more prior service personnel. This can be done to a point. The supply of non-high school graduates and CAT IV personnel is much larger than has been previously tapped by the services. CAT IV personnel are currently running at less than 5 percent of enlistments. In the past this percentage has run over 15 percent. However, there is a cumulative spiraling effect associated with lower quality. Lower quality enlistees have higher turnover rates prior to end of service term. This has the effect of increasing accession requirements in the next years. Lower quality also means additional cost associated with training, which would put additional pressure on the manpower budget.

Across the board pay increases in order to increase supply is not feasible. Manpower budgets already comprise more than 1/2 of DOD spending, and is squeezing the amount spent on weapons. Pay raises are also a very inefficient way of increasing supply since pay increases would be made across the board for all personnel. However since higher quality enlistees may be in shortest supply, restructuring the pay system to one that is more civilianized would help. Pay would be increasingly based on market factors such as skill and education, thus allowing higher quality enlistees to earn more without raising pay for the entire force.

Reduction of physical standards would provide a limited increase in manpower supply, but would have less impact on increasing the supply of higher qualified enlistees.

Finally, a partial alternative to increasing the supply is to achieve a more effective overall force level through selective initiatives by each service that have the effect of balancing the supply of enlistees among services. This is already done by use of bonuses and allocation of the advertising and recruiting budgets. However, more could be done to more evenly distribute possible shortfalls across services and avoid the feast or famine situation for individual services.

Certainly, additional research is needed to improve confidence in current estimates and to evaluate the supply and demand alternatives. The results of recent research reviewed in this report and directions for future reserach are summarized below.

- Recent time series and cross-sectional models using volunteer data in the 1970-1976 period show significant effects due to unemployment. Unemployment elasticities vary across models from .0 to .6 depending on service group, mental category, educational attainment, and model formulation. These results differ from earlier models which generally showed either a weak unemployment or no unemployment effects. Recent results are probably attributable to use of volunteer data rather than enlistment data, the presence of significant variations in unemployment, improved variable specification of population, and concentration on analysis of higher quality supply limited groups. Prudence would probably indicate that elasticities in the range of $.3 \pm .2$ should be used for policy planning.

- It is important to use refined population measures which take account of the physical, mental, and educational characteristics of the 17-21 year old population. Use of aggregate measures of population for the period 1970-1976 hides significant variation in the prime enlistable age group - high school graduates not enrolled in college.

- Wage elasticities generally fall in the .4 to 1.5 range varying by service, enlistment group and model formulation. Recent results would tend to lower the pay elasticity from the traditional 1.25 to somewhat lower values around .75 to 1.0.

- Time series and cross-sectional analysis by age cohort should provide improved and more interpretable results. Generally the lumping together of 17-21 year olds into a homogeneous group has ignored significant differences in wages, tastes, unemployment and population dynamics. Isolating age cohorts should improve significantly the "signal to noise" ratio of regression measurements.

- More research effort should be placed in modeling the dynamics of the youth labor market in order to derive elasticities rather than reliance on regression analysis. Significant amounts of information on the statistical distributions of youth wages, propensity to enlist, tastes, and educational behavior are being largely ignored in current analysis. One direction is to construct simulation models of the youth labor market.

Two emerging trends appear likely to make manpower perhaps the critical issue for defense in the next 8 years. The first trend is the well documented rising cost of manpower. Manpower-related costs now comprise about 55 percent of the DOD budget, and it is likely to take major changes in manpower policies to reduce this percentage. The second trend is the supply of highly qualified enlistees is likely to decline beginning around FY 78 with substantial reductions occurring in the 1985-1995 time period. This decline could bring 30-40 percent reduction from current levels. This decline will certainly bring new pressure on manpower budgets, especially if the all-volunteer policy is continued. The two trends of rising costs and declining supply will certainly bring a reevaluation of the all-volunteer concept. Projections made earlier in this report show that serious shortfalls could occur as early as FY 85 with larger shortfalls expected in the FY 87 - FY 95 period. What is important to realize however, is that long-range planning can probably avert impacts due to the projected declines. However, there is very little that can be done in the short run once quality declines have taken place in response to declines of this magnitude other than returning to a draft. Our commitment to maintain a strong-all-volunteer force may thus revolve around our commitment to sound long-range planning. Such long-range planning is traditionally done by the services for weapon systems. However, long-range planning for manpower is virtually nonexistent in DOD. A commitment to the all-volunteer concept means that personnel is treated

as a supply limited item and planning must be done within the realistic constraints of the number and quality of what is to be available. This means that weapon systems design, capital outlays for facilities, force level planning and structuring must all be done with manpower considerations in mind. The weapon system "design to cost" philosophy will also have to include "design to manpower." Failure to integrate manpower planning into these other crucial decisions will probably mean that no alternatives are left but to return to a draft system, probably as early as 1985.

If we should return to a draft, it should be a decision made after consideration of all the options for maintaining a volunteer force. Many of those options are present only if we begin planning for them 5 to 20 years in advance. If we do not do the long-range planning, a draft system will return by default. The time is now for beginning that planning in view of the potential shortfalls in 1980-2000.

CHAPTER 1

FACTORS LIKELY TO INFLUENCE MILITARY MANPOWER SUPPLY

Factors that influence the supply of service enlistments can be grouped under five broad classifications for purposes of our discussion.

1) Civilian labor market factors

2) Educational opportunities factors

3) Military compensation and benefits

4) Population/demographic/educational attainment factors

5) Attitudinal and cultural factors

The first two factors represent the main competitive career paths for the military. Almost all people in the 17-21 year old population choose either to be in school, enter the military or enter the civilian labor force. Understanding the variables that influence this choice is crucial to military supply analysis. The fourth factor takes account of the number and non-attitudinal characteristics of the population available to enter military service. Changes in either the number available or their characteristics will change the number and quality of enlistees. The fifth factor covers those attitudinal and cultural factors which influence military enlistments. These factors are usually more slowly changing influences, but ones that can influence military supply in the long run. An understanding of how these factors will change, and what

influence they have on enlistments would permit greater confidence in long term projections.

Roughly 1 out of 2 18-19 year olds enter the civilian labor force. A significant proportion of these (10-20 percent) do not find jobs. Those who find jobs have a high turnover (37 percent annually). Jobs available for this age group usually require unskilled or semi-skilled labor and average wages are relatively low. The attractiveness or non-attractiveness of the civilian labor force to a young person has at least three dimensions:

1) Probability of employment

2) Civilian wages

3) Nonpecuniary benefits of civilian job

   a) travel opportunities
   b) training opportunities
   c) job security
   d) job safety/risk

Almost all models of enlistment behaviors have attempted to incorporate unemployment and civilian wage variables. While most analysis shows a rather consistent significant influence due to wage effects, only recently have consistent results began to appear for unemployment effects. Four recent measurements to be reviewed later in this report which include data for the 1970-1975 time period do show significant unemployment effects. A few models have attempted to take account of differences in nonpecuniary benefits between military and civilian jobs.

Some have included risk variables (Vietnam hostility level), for instance. For short run projections (0-5 years) inclusion of only wage and unemployment variable to measure the civilian labor market is probably adequate. However, over the long run inclusion of consideration of civilian training opportunities and job security may be very important in projecting military supply. Many labor market analysts predict a more competitive labor market for young noncollege-educated people. With college costs rising and the returns to college possibly declining, more people in this age group would be looking for training opportunities and entrance channels into the labor force. Job security factors would also become more important considerations. Under these conditions military supply could increase. Present enlistment supply models cannot presently adequately handle such scenarios. While part of these effects might be reflected in unemployment rates and wage rates for youth, important nonpecuniary aspects of the value of job training and job security would not be adequately represented. In the long run these type of factors could play an important role in determining changes in enlistment supply.

Roughly 1 out of 2 high school graduates enter college. The higher education market is thus a major competitor for the services. The attractiveness or nonattractiveness of the education market can also be viewed in several dimensions:

1) Cost of college

2) Returns from college education

3) Availability/accessibility of college

4) Nonpecuniary benefits of college

Costs of college education have been rising, while many observers feel the returns in terms of increased lifetime wages are declining. Many observers predict an increasing gap between college costs and availability of funds to finance college education. The supply of college graduates is also predicted to significantly exceed the demand. This situation seems to be leading to a new competitive professionalism among youth. These dynamics could have significant influence on the military labor market. College education has also been made more accessible to increasing numbers through local 2-year colleges. Enrollments in two-year colleges have been booming. Most enlistment models have ignored the education market as an influence on enlistments. A few have incorporated this variable by factoring out the number of college enrollees from the population variable. However, the college market could become a more significant influence on enlistments if the proportion of enrollees continues to decline. Adequate consideration has generally not been given to the role of the education market on enlistment behavior.

Military wages and benefits, of course, play a critical role in enlistment behavior. The primary variable used in enlistment supply analysis is the RMC military pay discounted over the enlistment period. The RMC pay includes the estimated value of tax advantages, housing and food. However, some benefits such as the G.I. Bill, travel and training opportunities have not been included in supply analysis.

The number and characteristic of 17-21 year olds is a prime supply determinant also. Factors that need to be considered include:

1) Population of 17-21 year olds

2) Educational characteristics (high school graduates)

3) Mental characteristics (technical, reading skills)

4) Health characteristics (physical standards)

The composition of the 17-21 prime enlistment pool will change substantially in the next 25 years. The enlistment pool will be smaller by about 20 percent by 1991. The educational characteristics may also change in the next 25 years. However, the percent of persons obtaining a high school diploma has been relatively stable at 75 percent over the last 5 years, although the proportion of black graduates has been increasing. Recent experience in mental qualification trends tend to show slight decline in verbal and mathematical ability.

Finally, attitudinal and cultural trends could play a dominant part in enlistments over a long time period. Recent post-Vietman War trends show more favorable attitudes toward the military. Other factors that need to be considered include family formation trends and job and work orientation. Changes in timing of marriages and child bearing among younger people may play a role in enlistment behavior.

Most of the modeling of military supply has concentrated on factors that influence supply in the short run (0-3 years). For making short term projections, these models are adequate. However for projections over a 25-year period, consideration needs to be given to other factors which

can influence supply over the long run. Examples of short run factors include unemployment and relative military/civilian wages. These are factors which can change over a 0-3 year period, and if they change, we expect enlistment supply to change relatively quickly (0-1 year) in response. However models that measure the effects of these short run factors have to assume a relatively unchanging world except for those factors. To project future long-term enlistments with increasing levels of confidence requires that we begin to understand more about what role these long-run behavior factors play in enlistment behavior. Research aimed at the future of the volunteer force needs to focus increasingly on dynamic models of the labor market, including microsimulation and closed form analytical models. Such models are superior to regression models for predicting some of the longer-term dynamics of the youth labor market.

CHAPTER 2

BRIEF REVIEW OF SELECTED STUDIES ON ENLISTMENT SUPPLY

There have been numerous studies intended to measure the enlistment response to changes in certain economic as well as in noneconomic variables. These studies in order to be comparable need to be divided into 4 groups as shown in Figure 1. Time series and cross sectional models have well known differences when estimating economic parameters and comparison of results between these two methods needs to be done cautiously. For military supply analysis, studies performed using data prior to 1970 have a major difference to those using post 1970 data. Prior to 1970 volunteer enlistment supply could only be estimated by including a draft variable in the model to separate out the effects of the draft from volunteer enlistments. After 1970, analysis of lottery numbers made volunteer enlistment estimates independent of the draft. The lottery data enabled more accurate estimates of volunteer enlistments to be made. The lottery also changed the dynamics of the draft in that draft pressure was known far in advance of actual enlistment. For this reason, time series models which include a draft variable for pre-1970 data will have difficulty fitting post 1970 data. For these reasons, analysis done of pre-1970 data is of lesser importance than analysis of past 1970 data in forecasting volunteer enlistments. Reviews of these studies are contained

Pre-1970 Data Cross Sectional	Post 1970 Data Cross Sectional
Pre-1970 Data Time Series	Post 1970 Data Time Series

Figure 1

Classification Scheme for Enlistment Supply Studies

in other reports.[1,2] Emphasis in this report will be on recent studies using post 1970 data. In this review, three studies using data from the post 1970 period will be compared. Two of the studies[3,4] are time series studies and one is cross sectional.[5] These are the only recent studies which fully utilize enlistment data from all services and are sensitive to the problem of supply and demand constrained enlistment groups.

A recent time series[3] study disaggregated monthly enlistment data (1970-1975) by mental category and educational attainment. Volunteer enlistments were calculated using lottery data. The dependent variable was the ratio of monthly volunteer enlistments to the 17-21 year old population. Regressions were run for CAT 12 HS, CAT 3 HS and CAT 1,2 NHS for each service. Independent variables were the ratio of military to civilian pay and the 16-21 year olds out of school unemployment rate. Three model formulations were tested - linear, Cobb Douglas and a multiplicative/linear model. Wage elasticities range from .6 to 1.7 depending on service and quality group. Unemployment elasticities for higher quality groups range from .4 to 1.25, while for lower quality groups, unemployment elasticities are negative.

A recent study by Cooper reports time series results based on a logistic model formulation where coefficients are estimated by pooling semiannual volunteer data from each service during the period 6/70 to 6/76. The measure of enlistment supply is the ratio of CAT I-III high school graduate enlistments to a weighted 17-21 year old high school graduate

population measure. Each cohort in the 17-21 year old group is weighted according to the relative proportion of enlistments in this age group. Independent variables include production recruiters, ratio of military to civilian pay, unemployment rate for 18-19 year old males, and a seasonal dummy. The reported coefficients were estimated by pooling data from each service and constraining the coefficients to be the same for each service. The author also states that separate coefficients were estimated for each service and that the individual service coefficient in no case differed significantly from the pooled estimates. The results show each of the independent variables to be statistically significant. Wage elasticities ranged from .75 to 1.5, recruiting elasticities between .18 to .31 and unemployment elasticities from .11 to .27. Generally, the quality of the fit is dependent on the service with better fits being obtained for the Army and Navy (R^2 = .7 to .9) and poorer fits for the Marine Corps and Air Force (R = .3 to .5). The author mentions one major reservation in interpreting the results. The recruiting and wage variables are highly correlated (r = .9), thus estimates tend to be unstable if small variation in assumptions are used in the model.

An additional estimation assumption should be mentioned for time series models in the 1970-1975 period. Wage elasticities are sensitive to whether draftees with high lottery numbers in the 1970-1972 period are included as volunteers. The first study included these draftees as volunteers, while the Cooper study has excluded them.

Dan Huck and Jerry Allen of General Research Corporation (GRC) have estimated supply elasticities utilizing a cross-sectional model based on CY 75 data for CAT I-III A high school graduate enlistments for each service. The model includes as independent variables recruiters on-station, qualified military availables, civilian pay, and unemployment. The data utilized by GRC also has two major improvements over previous cross-sectional estimates. First, the population variable used measures qualified military availables (QMA). This variable was devised through extensive work with Census and AFEES data. The final QMA variable represents only those 17-21 year olds who are high school graduates in mental category I-III A and are physically eligible and not continuing advanced education. Thus variation among states due to differing mental and physical characteristics as well as differing educational opportunity have been eliminated. Secondly, the dependent variable was CAT I-III A enlistees, whereas most previous cross-sectional measurements used a broader enlistment group (CAT I-III). Due to the fact that CAT I-III enlistments are not supply limited for each service, results of these previous models tend to be harder to interpret.

The main results of the GRC study show population elasticities to be positive and significant, but less than one. For the Army, Navy and Marine Corps, population elasticities are in the .4 to .5 range, while the Air Force population elasticity is .1. Unemployment elasticities are significant and positive for the Army and Air Force and estimated to be approximately .3, while the Navy and Marine Corps show no significant

unemployment effects. Wage elasticities are positive and significant for the Army and Navy, but not for the Air Force and Marine Corps. The Army wage elasticity estimate is 1.48, while the Navy estimate is .65. Finally, recruiting elasticities are positive and significant for each service and range from .46 to .81.

The characteristics of the four measurements are compared in Table 1. In comparing the models the main item of interest is the extent to which the forecasts of the models differ. In this writer's opinion more effort should go into comparing model forecasts than in comparing individual supply elasticities. Elasticities are strictly not comparable between models and such comparisons fail to take into account the holistic nature of a model. Supply elasticities will vary depending on the model formulation, variable definition, other variables included in the model, and estimation procedure. What would be desirable at this stage of research is to provide a uniform set of assumptions about the future to each model team, and to have forecasts produced from each model. It should be emphasized that producing a set of assumptions that can be plugged into each model is not always a trival task. Specification of wage and unemployment scenarios for instance must be interpreted in terms of the particular variable used by each model. General unemployment rates, for instance, must be converted to various youth unemployment rates.

Table 1

Comparison of 3 Measurements of Enlistment Supply

	Type	Service	Model	Dependent Variables: Enlistment Group	Dependent Variables: Population Variable	Independent Variables
Cooper[1]	Time Series Semiannual 7/70-6/76	Pooled Data From 4 Services	Logistic	CAT I-III HS	Weighed 17-21 High School Graduates	On-station recruiters 18-19 unemployment rate Military/civilian wage ratio
Amey et al.[2]	Time Series Monthly 7/70-6/75	All Service Separately	Linear Cobb Douglas Nonlinear	CAT I-II HS CAT III HS CAT I-II NHS Black, Nonblack	17-21 Year Olds	16-21 out-of-school unemployment rate Military/civilian wage ratio
Huck Allen[3]	Cross Sectional CY 75	All Services Separately	Cobb Douglas Cobb Douglas Modified by Gauss-Marquardt Technique	CAT I-III A HS White, Nonwhite	Not Used As Dependent Variable	Qualified military availables Recruiters on-station General unemployment by State Civilian pay

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1/ Cooper, Richard V. L., Defense Without the Draft (forthcoming book), the RAND Corporation.

2/ Amey, Dorothy; Allen Fechter; David Grissmer; Gerry Sica, Supply Estimation of Enlistees to the Military, General Research Corp., McLean, Virginia (prepared for Defense Manpower Corporation).

3/ Huck, Daniel and Jerry Allen, Sustaining Volunteer Enlistments in the Decade Ahead: The Effect of Declining Population and Unemployment, General Research Corporation, McLean, Virginia.

At the present time, forecasts under a uniform set of assumptions is not available from the models. In place of this, comparison of supply elasticities will be done while recognizing that strict comparability is a somewhat risky procedure. However, comparing elasticities can provide a picture of broad areas of agreement and disagreement as long as the criteria for agreement and disagreement allow room for individual variation due to mathematical model formulation, variable specification, estimation procedure and effect of additional model variables.

Two comparisons of model elasticity are made here. Table 2 compares estimates of DOD-wide pay, unemployment, population and recruiting elasticities from 3 measurements of enlistment supply. Table 3 compares measurements of enlistment supply for the wage and unemployment elasticities for each service. Several small adjustments noted in the footnotes to Table 2 to the actual reported results were made in order to obtain an estimate which was comparable for total DOD CAT I-III HS enlistments. There is general agreement about the sign and significance of the pay and unemployment variables. The results show that a one percent increase in the military/civilian pay ratio would bring a .8 to 1.1 percent increase in enlistments. Also, a 1 percent increase in the youth unemployment rate would bring a .2 to .3 percent increase in enlistments. The major differences in the models occur for recruiting

Table 2

Comparison of Supply Elasticities From Recent Models for DOD Wide Cat. I-III H.S. Enlistments

	Pay	Unemployment	Recruiting	Population
Cooper[1]	1.1	.2	.3	1.0[5]
Amey, et al[2]	1.1	.3	-[4]	1.0[5]
Huck, Allen[3]	.8	.2	.6	.4

1. Estimates are from the constrained, pooled semi-annual time series estimates for all services for Cat. I-III H.S. enlistments.

2. Estimates are taken from DOD monthly time series estimates using a weighed average of Cat. I-II H.S. and Cat. III H.S. results.

3. Estimates are taken from cross sectional results from each service weighed across services and extrapolated from Cat. I-II H.S., Cat. I-IIIA H.S. groups to form an approximate DOD estimate for Cat. I-III H.S. enlistments.

4. Recruiting variable not included in model.

5. Population elasticity assumed to be one.

and population elasticities. The cross-sectional model estimates a much higher recruiting elasticity than the time series model. Also the cross-sectional population elasticity is much lower than the elasticity assumed in the time series models. One reason for the disagreement of recruiting elasticities might be the high correlation that exists between recruiting and pay in Cooper's measurements, and the high correlation that exists between recruiting and population in the Huck, Allen model. This correlation makes the recruiting coefficients somewhat unstable. In addition, there are numerous variable definition, model formulation and estimation procedures which might account for the differences.

The agreement at the DOD aggregate level masks a good deal of difference in the models at the individual service level. Since the Cooper results for each service are not yet published, Table 4 shows a comparison of the remaining two models for each service. Generally, the time series model provides higher pay and unemployment elasticities than the cross-sectional model. Agreement is better for the Army than the other services. The disagreement is not surprising given that different bias exists in time series and cross-sectional measurement. More differences would also be expected in service results since each service enlistments are subject to inter-service competitive effects which are not included in the model.

Table 4

Comparison of Time Series[1] and Cross Sectional Model Elasticities[2]

	Pay Ratio	Unemployment
	Army	
Time Series	1.2	.4
Cross Sectional	1.3	.3
	Navy	
Time Series	.9	.5
Cross Sectional	.6	.0
	Air Force	
Time Series	.8	.9
Cross Sectional	.0	.3
	Marines	
Time Series	.7	1.3
Cross Sectional	.0	.0

[1] Amey, D., A. Fechter, D. Grissmer, and G. Sica, loc.cit.

[2] Huck, Daniel F. and Jerry Allen, Sustaining Volunteer Enlistments in the Decade Ahead: the Effect of Declining Population and Unemployment, General Research Corporation, March 1977 (prepared for the Office Assistant Secretary of Defense Manpower and Reserve Affairs).

NOTES

1/ For a review of these studies, see Amey, D., A. Fechter, D. Grissmer, and G. Sica, Supply Estimation of Enlistees to the Military, General Research Corporation, June 1976 (prepared for Defense Manpower Commission).

2/ Amey, D., A. Fechter, D. Huck and K. Midlam, Econometric Models of Armed Forces Enlistment Levels, General Research Corporation, (prepared for the Office of Naval Research).

3/ Amey, D., A. Fechter, D. Grissmer, and G. Sica, loc. cit.

4/ Cooper, Richard V. L., Defense Without a Draft (forthcoming book), The RAND Corporation.

5/ Huck, Daniel F. and Jerry Allen, Sustaining Volunteer Enlistments in the Decade Ahead: the Effect of Declining Population and Unemployment, General Research Corporation, March 1977 (prepared for the Office Assistant Secretary of Defense Manpower and Reserve Affairs).

CHAPTER 3

NEW TIME SERIES ANALYSIS

Two modifications to the monthly time series analysis has been made and will be reported here. The first modification is a simple updating of the data base with more data. The second modification is experimentation with a new population measure. The results are summarized below.

Updated Results of Monthly Time Series Model

The monthly time series results reported to the Defense Manpower Commission[6/] covered the period 6/70 to 6/75. New regressions have been run for 4 enlistment groups (NAVY-12 HS, 3 HS and DOD 12 HS, 3 HS) with an improved data base. The changes made to the data for the new runs are:

1) all variables were extended through 1/76.

2) the previous analysis used enlistment variables estimated from published data for the period 1/75 to 6/75. These estimated values have been replaced with data derived from the GRC enlistment data base.

3) Revised estimates of the civilian income for 18-21 year olds for 1974 was included in the new analysis.

Appendix A contains the time series data used in the analysis.

The primary purpose of extending the analysis was to test the sensitivity of the unemployment elasticity to extensions of the data. High unemployment rates have been present only since the latter part of 1974. Extension of the data through 1/76 roughly doubled the number of points where unemployment rates were high.

The new data was run for the Cobb Douglas model only. Earlier results showed only minor differences in the elasticity results of those models tested. A comparison of the old and new results are given in Table 5. The new measurements are in no instance statistically different from the old results. The difference between the elasticities is not statistically different from zero at the 90 percent confidence level. However estimates of elasticities have changed in some cases with the new measurements. For the Navy results, the pay elasticities have decreased slightly, while the unemployment elasticities have increased and have greater significance. For Navy 3 HS enlistments, the unemployment elasticity has increased from .45 to .65. The new results for DOD 12 HS enlistments show slightly decreasing pay and unemployment elasticities. For DOD 3 HS, both pay and unemployment elasticities both increase. In all cases the F value of the unemployment coefficient increases for the new measurements indicating that additional data at high unemployment rates has strengthened the confidence that unemployment affects enlistments. The Durbin Watson statistic has generally increased in value indicating that the probability of missing variables is somewhat reduced for the new measurement.

Table 5

Comparison of Time Series Results

	Pay Ratio Variable				Unemployment Variable				R^2	D-W
	Elasticity	Standard Error	F-Value	Delay	Elasticity	Standard Error	F-Value	Delay		
					NAVY 12 HS					
OLD	1.03	.15	45.7	-6	.55	.13	18.6	-2	.85	1.15
NEW	.92	.17	29.8	-6	.49	.10	25.3	-0	.83	1.27
					NAVY 3 HS					
OLD	1.61	.22	54.0	-0	.32	.17	3.6	-2	.85	1.02
NEW	1.55	.24	42.7	-6	.65	.14	22.2	-0	.81	.86
					DOD 12 HS					
OLD	.88	.10	84.2	-6	.44	.08	31.8	-2	.93	1.34
NEW	.81	.14	35.7	-6	.37	.08	23.7	-0	.87	1.58
					DOD 3 HS					
OLD	1.15	.14	72.0	-6	.29	.14	4.6	-6	.91	.84
NEW	1.24	.17	52.5	-6	.48	.09	25.5	-0	.86	1.39

Two limitations of the present measurement are the absence of variables reflecting increasing recruiting and advertising resources during this period, and the absence of wage, unemployment and population data for individual education and mental category groups. The recruiter variable is highly correlated with the pay variable, thus making independent estimates of pay and recruiting effects somewhat unstable. The recruiting variable is not highly correlated with the unemployment variable. Inclusion of the recruiting variable would likely reduce the pay elasticities and not significantly affect the unemployment elasticities. Thus these estimates probably reflect upper level limits to the effects of pay.

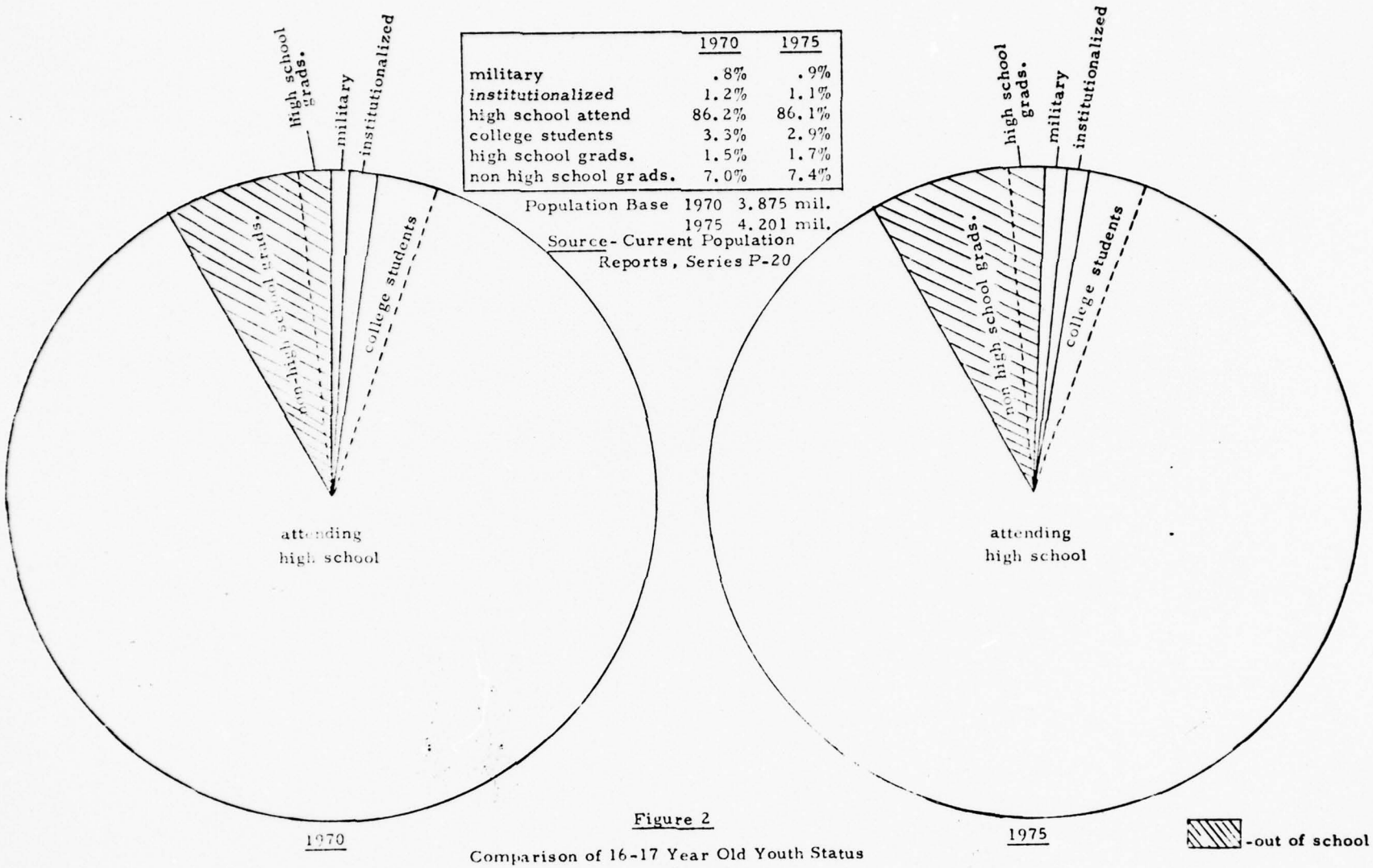
Inclusion of mental category and educational attainment specific wage, unemployment and population data would be desirable in these measurements. The elasticities would not be significantly affected if the correlation between aggregated and disaggregated mental category and educational attainment specific data is high. For instance, wage and unemployment data for high school and nonhigh school graduates generally can be expected to show similar trends, although the absolute wage and unemployment levels will be different for the two groups. Age, specific population and education data would probably improve the signal/noise ratio of the measurement since, as will be shown in the next section, there were significantly different trends by age group for some of these variables over thelast 7 years. However, it is recommended that future time series measurements try to develop more disaggregated measures of population, wage, education and unemployment data.

Results With New Population Variable

The three measurements described earlier in this report use different measures of the population base. Grissmer uses the civilian, noninstitutionalized 17-21 year old population for his monthly time series analysis. Cooper uses a weighted average of the number of the 17-21 year old population times a measure of the percentage of this group who are high school graduates where the weights reflect the relative enlistment rates among different age groups. His measure of the percentage of high school is the percentage of the 18-21 year old population who are high school graduates. Huck, Allen use the most refined population measure in their cross-sectional analysis. They define a 17-21 year old population variable of diploma high school graduates who would be physically qualified and classified in the relevant mental category group and who are not pursuing further schooling. Nationally, this group represents approximately 6 percent of the noninstitutionalized, male, civilian 17-21 year old males. Census data and projections are used to determine educational, military and institutionalized status of the population. AFEES data is used to estimate proportion of the population physically qualified and in various mental category groups. However since AFEES applicants are not a random sample of the population, some bias will result in this estimation.

For cross-sectional analysis it is probably more important to refine the population variable since physical and mental characteristic and educational attainment vary widely among states.

For time series models, over short periods, physical and mental category characteristics change relatively slowly, however educational attainment might have significant variation. Over the 5-year period from 1970-1975 important changes occurred in the college educational trends among 17-21 year old civilian population. Also an important change occurred in this time period in the percentage of men in this age group who were in the military. This is illustrated in Figures 2, 3, and 4. A comparison is made in these figures between 1970 and 1975 for activities of the 17-21 year old population. For the 16-17 year old group, no significant overall percentage changes have occurred in the status of the group. Almost 90 percent of this group is in school. The out-of-school high school graduate group has increased from 60,000 to 71,000 and the number of out-of-school nonhigh school graduates has increased from 276,000 to 319,000. For the 18-19 year old group, significant changes have occurred in their status between 1970 and 1975. The percentage of 18-19 year olds out of school has increased from 40.3 to 46.1 percent. In 1970 1.528 million of this group were in school while in 1975, 1.951 million were out of school. Among those out of school, the percentage who were high school graduates has increased from 26.1 percent to 31.8 percent. This group is the prime enlistment pool and the increase from .991 to 1.348 million can perhaps account for part of the volunteer enlistment increases in the 1970-1975 period. The increase in the out-of-school group was accompanied by a percentage decline in high school



	1970	1975
military	.8%	.9%
institutionalized	1.2%	1.1%
high school attend	86.2%	86.1%
college students	3.3%	2.9%
high school grads.	1.5%	1.7%
non high school grads.	7.0%	7.4%

Population Base 1970 3.875 mil.
1975 4.201 mil.
Source- Current Population Reports, Series P-20

Figure 2

Comparison of 16-17 Year Old Youth Status
Between 1970-75

	1970	1975
military	9.1%	7.9%
institutionalized	2.6%	.2%
attend high school	12.5%	12.1%
college students	35.5%	33.7%
high school grads.	26.1%	31.8%
non high school grads.	14.2%	14.2%

Population Base 1970 3.349 million
1975 3.891 million

Source- Current Population Reports, Series P-20

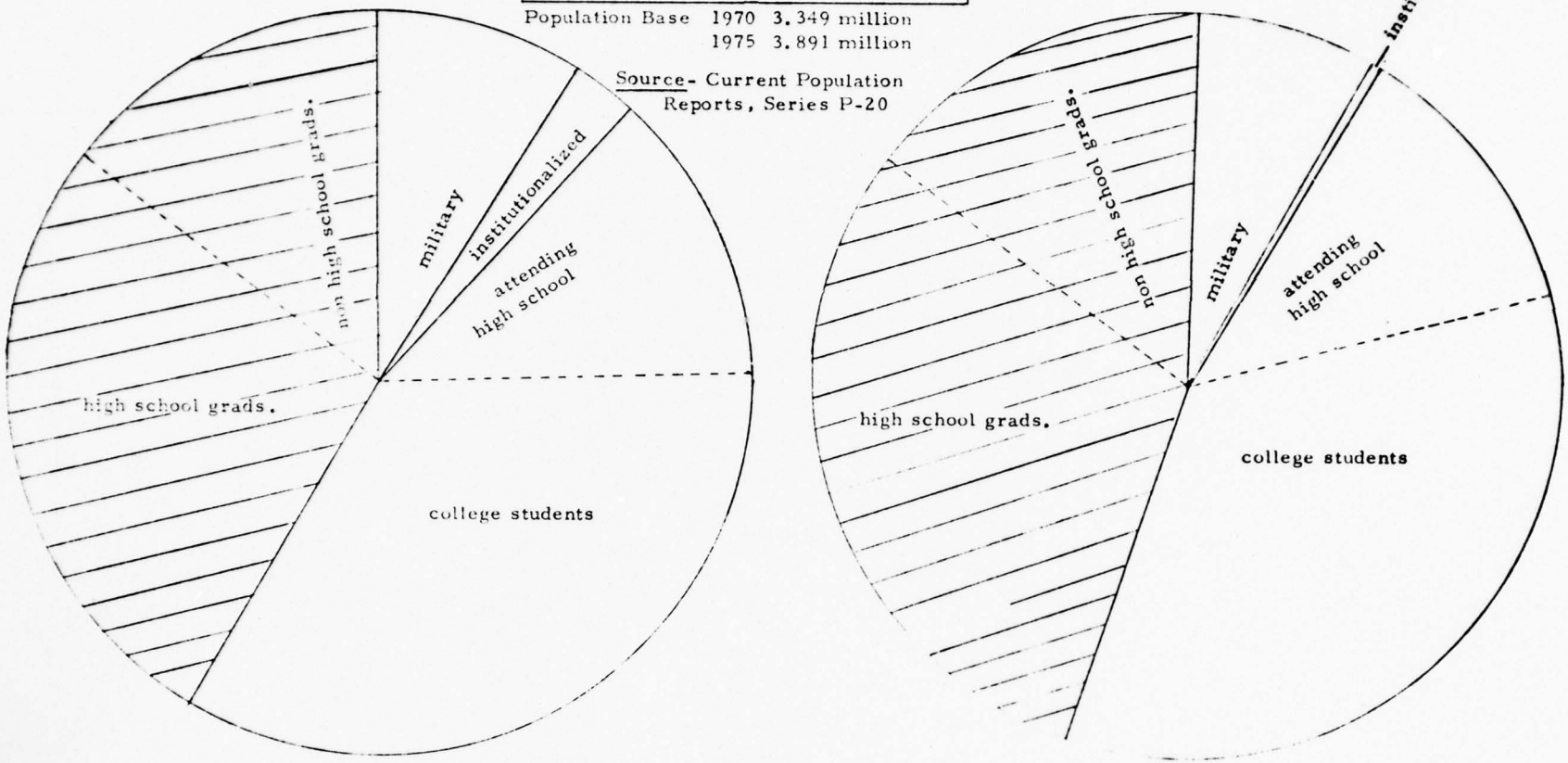


Figure 3

Comparison of 18-19 Year Old Youth Status between 1970-75

	1970	1975
military	24.5%	9.7%
institutionalized	2.8%	.6%
attend high school	1.3%	1.2%
college students	29.7%	30.5%
high school grads.	30.0%	43.3%
non high school grads.	11.7%	14.7%

Population Base 1970 2.651 million
1975 3.693 million

Source- Current Population Reports, Series P-20

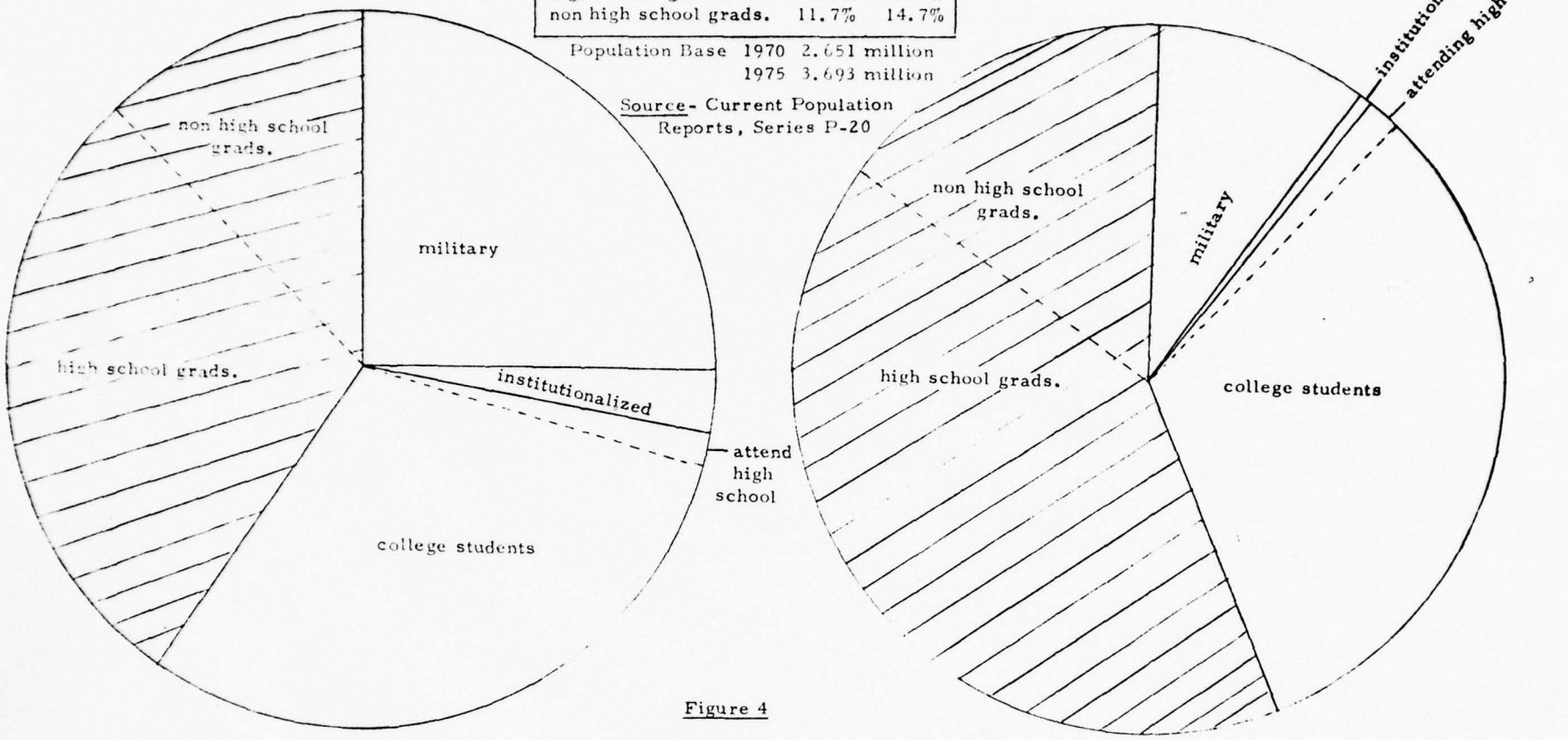


Figure 4

Comparison of 20-21 Year Old Youth Status between 1970-75

and college enrollments for this group. Declines were also registered in the percentage of 18-19 year olds in the military and in institutions. The changes in the status of the 20-21 year old male population are even more dramatic. The percentage of this group in school (primarily college) has stayed relatively stationary, however major changes have occurred in the percentage in the military (24.5 to 9.7), percentage in institution (2.8 to .6) and the percentage out of school (41.7 to 58.1). Among those out of school, the percentage who have high school diplomas has risen from 1.094 million to 1.783 million, a 63 percent increase.

Table 6 compares the changes in status of the 18-21 year old population from 1970-1975. While the overall population has increased 12.3 percent, the percentage increases in segments of the population varies drastically. The fastest growing portion of this population group is the high school graduate who is not going to college. This group has increased 50.2 percent over this period. This growth rate is 4 times the growth rate of the general population. Since this group is the prime target group for military enlistees, it is important to include this growth in time series analyses. Significant other segments that expanded faster than the general population include the high school dropout group (25.5) (the second most populous enlistment market), the civilian population (22.9) and the civilian noninstitutionalized population (26.4). The latter two increases reflect a dramatic drop in the percentage of youth in the military and in institutions. Basically, this reflects the end of the

Table 6

Comparison of Status of 18-21 Year Old Population for 1970-1975

	1970	1975	Difference	Percentage Difference
Total Population	7438	8349	911	12.3
Civilian Population	6198	7616	1418	22.9
Civilian, Noninstitutionalized	6000	7584		26.4
In School	2952	3244	292	9.9
High School	523	562	39	7.5
College	2429	2682	253	10.4
Out of School	3048	4340	1292	42.4
High School Graduate	2085	3131	1046	50.2
Nonhigh School Graduate	963	1209	246	25.5

Vietnam war which was accompanied by smaller military forces and less dissent. The percentage of youth in college and high school has grown slower than the general population growth. This may reflect higher college tuition costs and possible perceived reduced return from college education.

The large increase in the prime enlistable group has not been previously included in time series analysis. It is clear from the above data that the economic dynamics of the 17-21 year old group varies widely within their age group. Thus, future time series analysis should not consider the 17-21 year old group as homogeneous, but should further disaggregate by age cohort, and derive age specific population, wage and unemployment data. It is also important in future analysis to give more thought to variable specification of the population variable. For instance, increases in population of the prime enlistable group of the order of 50 percent will affect other variables such as the unemployment rate and wage rate. These correlations between variables in the analysis make it difficult to adequately explain the observed behavior with single time series or cross-sectional analysis. More effort needs to go into discovering the structural relationships of the youth labor market.

Time or resources were not present in the current contract to extensively pursue new modeling activity beyond singly updating the Defense Manpower Commission models as reported in a previous section. However several regression runs were made using a new population measure. These runs were made basically to find out how

sensitive the previously reported wage and unemployment elasticities might be to changes in the population measures. The population measure used was the 17-19 year old high school graduate not currently enrolled in school. The 20-21 year old data was excluded since the draft removed a significant number of 20-21 year olds from the population in 1970-1973. This had the effect of disturbing the timing of volunteer enlistment decisions of many in this age group (i.e., a man who was drafted in 1973 at age 19 may have voluntarily enlisted at age 20 or 21). Ideally 17-19 year old high school graduate enlistment data should be used in the analysis, however, time or resources to generate this data was not present. The wage and unemployment data was identical to that used for the previous analysis.

A main effect of including the new population measure is to further destabilize the pay elasticity. This is due to the high correlation which exists between pay, population and the recruiting variable show in Table 6.

Table 7 compares the regression results for DOD volunteers when using two different population measures. The primary effect of using the more specific population measure is to reduce the significance and size of the wage elasticity. Basically, this comparison raises the possibility that a significant part of the increase in volunteer enlistments in the 1970-1975 period might be attributable to a population effect rather than a wage effect. Further modeling is necessary before any firm conclusions are warranted. The new population variable does not significantly affect the unemployment elasticities or the general quality of fit parameters.

Table 6

Correlation Matrix of Time Series Variables

	Pay Ratio	Recruiting	Population	Unemployment
Pay Ratio	1.0	.87	.82	-.15
Recruiting	.87	1.0		.13
Population	.82		1.0	.17
Unemployment	-.15	.13	.17	1.0

Table 7

Comparison of Three Regression Models for DOD Volunteer Enlistments

DOD 12 HS

Dependent	Population			Pay Ratio				Unemployment				R^2	D-W
	Elas	St. Error	F-Value	Elas	St. Error	F-Value	Delay	Elas	St. Error	F-Value	Delay		
DOD 12 HS	.32	.24	1.8	.96	.30	10.6	(-6)	.49	.09	27.5	(0)	.88	1.59
DOD 12 HS/POP1				.21	.14	2.3	(-6)	.42	.08	29.6	(-2)	.86	1.42
DOD 12 HS/POP2				.81	.14	35.7	(-6)	.37	.08	23.7	(0)	.87	1.58

DOD 3 HS

Dependent	Population			Pay Ratio				Unemployment				R^2	D-W
	Elas	St. Error	F-Value	Elas	St. Error	F-Value	Delay	Elas	St. Error	F-Value	Delay		
DOD 3 HS	1.36	.17	66.0	.28	.23	1.5	(0)	.43	.09	21.8	(0)	.90	1.40
DOD 3 HS/POP1				.63	.16	15.1	(-6)	.51	.09	30.8	(-2)	.87	1.33
DOD 3 HS/POP2				1.24	.17	52.5	(-6)	.48	.09	25.5	(0)	.86	1.39

Table 8

Comparison of Three Regression Models for Navy Volunteer Enlistments

N 12 HS

Dependent	Population			Pay Ratio				Unemployment				R^2	D-W
	Elas	St. Error	F-Value	Elas	St. Error	F-Value	Delay	Elas	St. Error	F-Value	Delay		
N 12 HS	.88	.34	6.7	.45	.40	1.3	(-6)	.49	.12	16.3	(0)	.86	1.28
N 12 HS/POP1				.33	.17	3.8	(-6)	.47	.10	22.4	(0)	.82	1.28
N 12 HS/POP2				.92	.17	29.8	(-6)	.49	.10	25.3	(0)	.83	1.27

N 3 HS

Dependent	Population			Pay Ratio				Unemployment				R^2	D-W
	Elas	St. Error	F-Value	Elas	St. Error	F-Value	Delay	Elas	St. Error	F-Value	Delay		
N 3 HS	1.52	.26	34.8	.68	.33	4.1	(0)	.51	.13	14.3	(-2)	.86	.98
N 3 HS/POP1				1.17	.24	23.3	(0)	.59	.13	20.9	(0)	.82	1.02
N 3 HS/POP2				1.55	.24	42.7	(-6)	.65	.14	22.2	(0)	.81	.86

Table 9

Comparison of Results Using Different Population Variables for DOD Enlistments

Dependent Variable - DOD 12 HS/POP

	Pay Ratio				Unemployment					
	Elasticity	Standard Error	F-Value	Delay	Elasticity	Standard Error	F-Value	Delay	R^2	D-W
NEW POP1[1]	.21	.14	2.3	(-6)	.42	.08	29.6	(-2)	.86	1.42
OLD POP2[2]	.81	.14	35.7	(-6)	.37	.08	23.7	(0)	.87	1.58

Dependent Variable - DOD 3 HS/POP

	Pay Ratio				Unemployment					
	Elasticity	Standard Error	F-Value	Delay	Elasticity	Standard Error	F-Value	Delay	R^2	D-W
NEW POP1[1]	.63	.16	15.1	(-6)	.51	.09	30.8	(-2)	.87	1.33
OLD POP2[2]	1.24	.17	52.5	(-6)	.48	.09	25.5	(0)	.86	1.39

[1] 17-21 year old civilian noninstitutionalized population.

[2] 17-19 year old high school graduates not enrolled in school.

Table 10

Comparison of Results Using Different Population Measures for Navy Enlistments

Dependent Variable - N 12 HS/POP

	Pay Ratio				Unemployment					
	Elasticity	Standard Error	F-Value	Delay	Elasticity	Standard Error	F-Value	Delay	R^2	D-W
NEW POP1[1]	.33	.17	3.8	(-6)	.47	.10	22.4	(0)	.82	1.28
OLD POP2[2]	.92	.17	29.8	(-6)	.49	.10	25.3	(0)	.83	1.27

Dependent Variable - N 3 HS/POP

	Pay Ratio				Unemployment					
	Elasticity	Standard Error	F-Value	Delay	Elasticity	Standard Error	F-Value	Delay	R^2	D-W
NEW POP1[1]	1.17	.24	23.3	(0)	.59	.13	20.9	(0)	.82	1.02
OLD POP2[2]	1.55	.24	42.7	(-6)	(.65)	.14	22.2	(0)	.81	.86

[1] 17-21 year old civilian noninstitutionalized population.

[2] 17-19 year old high school graduates not enrolled in school.

Table 8 produces similar comparison for Navy enlistments. The comparison shows similar trends as the DOD results.

One set of runs was made allowing the population variable (POP2) to be an independent variable and using volunteer enlistments as the dependent variable. Since there was a significant variation in the new population variable over the 1970-1975 time period, the possibility exists of measuring a population elasticity for the high school graduate, not enrolled in school population group. The results are shown in Tables 9 and 10. Comparisons are also made in these tables for wage and unemployment elasticities to the previous results. The results need to be interpreted with some caution since a high correlation (.82) exists between the wage and population variable. For DOD enlistments, the population, wage and unemployment variables enter the regression. For the higher quality DOD 12 HS group, the population elasticity is .32 and the pay elasticity is .96. For the DOD 3 HS group, the population elasticity is 1.36 and pay elasticity is .28. The magnitude and significance of the population and wage elasticity variables tend to be unstable because of their correlation. However, the results would suggest that when increases occur in the population of high school graduates who do not go to college, increases in CAT 3 HS enlistments increase significantly more than CAT 12 HS. Pay raises on the other hand tend to proportionally increase the higher quality group. The magnitude and significance of the unemployment elasticity is fairly

independent of the particular model used. However the pay elasticity is highly dependent on the particular population variable and model used. The results suggest that previous estimates of pay elasticity may be high due to a failure to take into account the dynamics of the population. Further analysis by age cohorts would shed additional light on this conclusion. The Navy results shown in Table 10 show population elasticities that are significant and large. The unemployment elasticities again are stable across models. The general effect of including the population variable is to reduce the magnitude and significance of the pay elasticity.

Conclusions

Certain conclusions seem warranted from the above analysis.

- Recent time series and cross-sectional models using volunteer data in the 1970-1976 period show significant effects due to unemployment. Unemployment elasticities vary across models from .0 to .6 depending on service group, mental category, educational attainment, and model formulation. These results differ from earlier models which generally showed either a weak unemployment or no unemployment effects. Recent results are probably attributable to use of volunteer data rather than enlistment data, the presence of significant variations in unemployment, improved variable specification of population, and concentration on analysis of higher quality supply limited groups. Prudence would probably indicate that elasticities in the range of $.3 \pm .2$ should be used for policy planning.

- It is important to use refined population measures which take account of the physical, mental, and educational characteristics of the 17-21 year old population. Use of aggregate measures of population for the period 1970-1976 hides significant variation in the prime enlistable age group - high school graduates not enrolled in college.

- Wage elasticities generally fall in the .4 to 1.5 range varying by service, enlistment group and model formulation. Recent results would tend to lower the pay elasticity from the traditional 1.25 to somewhat lower values around .75 to 1.0.

- Time series and cross-sectional analysis by age cohort should provide improved and more interpretable results. Generally the lumping together of 17-21 year olds into a homogeneous group has ignored significant differences in wages, tastes, unemployment and population dynamics. Isolating age cohorts should improve significantly the "signal to noise" ratio of regression measurements.

- More research effort should be placed in modeling the dynamics of the youth labor market in order to derive elasticities rather than reliance on regression analysis. Significant amounts of information on the statistical distributions of youth wages, propensity to enlist, tastes, and educational behavior are being largely ignored due to the lack of a theory relating these parameters.

CHAPTER 4

ENLISTMENT PROJECTIONS

General Assumption and Limitations

The projections will be based on the updated model results on the monthly time series model whose results are given in Table 5 . These enlistment supply equations are based on almost 6 years of volunteer supply data. The equations represent a fairly simplified model of the youth enlistment choice process. Projections based on the model are more credible in the short run where major changes in the dynamics of youth labor market are unlikely to occur. However, for projections further out than 5 years assumptions upon which the forecasts are made are more unlikely to hold. Thus, at best, the current long-term forecasts can provide only a rough indication of the range of variation which might occur in enlistment supply under different scenarios. In the 5-year time period, population will remain relatively stationary for the 17-21 year old group, and major changes in enlistment supply are likely to rise from changes in the unemployment and relative military/civilian wage rates, or from changes in educational opportunity available to youth. However in the longer run, several factors which are not accurately portrayed by the current simplified model are likely to impact on enlistment rates. These factors include:

1) Youth valuation of training and travel opportunities
2) Youth valuation of educational opportunities

3) Youth attitude toward job security
4) Changes in minimum wage laws
5) Youth employment programs
6) Complex interactives of population change, unemployment changes and educational trend changes

The current model assumes that enlistments will decline proportional to total 17-21 year old population. This assumption is made because variation in population was limited in the 1970-1975 period. This assumption is reasonable under two conditions:

1) population changes are spread uniformly throughout the 17-21 year old population. That is, the reduced population in 1990 looks exactly like the 1976 population except a percentage reduction has occurred uniformly in each relevant economic group.

2) Per capita recruiting and advertising effort remains the same.

If population reduction occurs nonuniformly across the 17-21 year old population, then population elasticities might be greater or less than one. For instance, if population reduction primarily takes place for higher income, higher I.Q. families, then population elasticities might be less than one. If population reduction occurs mainly in those groups likely to enlist (middle to low income, middle to low I.Q.) then population elasticities might be greater than one.

The second condition implies that more changes in population level may or may not affect enlistments depending on recruiting or advertising expenditures. Two models of enlistment behavior are possible. One model portrays the enlistee as a "walk-in" enlistment, influenced to enlist by factor completely outside the recruiting and advertising effort. In

this case changes in population would impact enlistments directly and the population elasticity would be one provided condition one is met. The second model portrays enlistments as "recruited in the military" so that the influence of the recruiter is necessary for enlistment. In this case population increases would not automatically result in enlistment increases unless per capita recruiting resources were kept constant. In the extreme case, the population elasticity would be zero for this case provided condition one is met. Actual enlistments fall somewhere between these two models so population elasticities would be expected to be somewhere between zero and one provided condition one is met.

There is some evidence to suggest that population declines in the 1980's and 1990's will occur to a greater extent among upper income and mental groups. A special study by the Bureau of the Census entitled, Population of the United States Trends and Prospects states:

> "The historic decline in fertility rate has generally occurred first in the middle and upper social and economic groups, among whom the women most often have the incentive and the opportunity to decide how much of their adulthood they wish to distribute between child centered and other types of roles."

The assumed population elasticities of one would be expected to be biased upward if population declines occur to a greater extent among upper income and mental groups. The population elasticity would also be biased upward since at least a portion of enlistees are recruiter motivated, and recruiter effort per capita is likely to rise with a decline in population. Thus a population elasticity of one has to be viewed probably as a "worst case" analysis.

In the 1980-1995 time period, some fairly major changes will also be taking place in the labor force. Some of these changes will probably impact youth wage and unemployment rates, however some will not be reflected in these variables. One possible scenario is a general tightening of the youth labor market caused by higher college costs, decreased returns form college education, and intense job competition from the more populous and highly trained 21-35 year old labor force. Such an economic atmosphere might well change youth valuation of military job training and travel opportunities, and the job security offered by military service. On the other hand, this economic atmosphere might generate changes in minimum wage law coverage or expanded youth training and employment programs. Such changes cannot adequately be handled with the current model. Except for the effect of government training and employment programs, the direction of these effects would be to make military enlistment look more favorable to youth. Government employment program are also likely to be designed with a view to minimizing the possible effect on enlistments. Thus if this scenario holds, declines are likely to be less than predicted by the current model.

Projections of the current model will tend to show larger declines than either of the other models reviewed here. The unemployment elasticities are larger than either of the other models and the population elasticity is larger like the Huck, Allen model. For these reasons, as well as other reasons sketched above, the current projection probably should be viewed as lower limits to enlistment declines.

Population Assumptions

The population assumptions included in the projections are the Series II and Series III projections of the Census Bureau. (See Appendix A for a discussion of population projection assumptions). Series II and Series III projections assume an ultimate completed cohort fertility rate of 2.1 and 1.7 respectively. These assumptions can be judged against historical rates as shown in Table 11.

Table 11

Historical Completed Cohort Fertility Rates of Women through 1970

Cohort Group 1/	Completed Fertility Rate 2/
1900	2.54
1905	2.33
1910	2.24
1915	2.40
1920	2.70
1925	2.89
1930 3/	3.10
1935 3/	3.07
1940 3/	2.72

1/ Birth year of women in Cohort Group

2/ Cumulative births per woman

3/ Based on actual experience through 1970 and projections of births between women of ages 30 and 45.

The data in Table 11 shows that the historical completed fertility rate has ranged between 2.24 and 3.10 for the women cohorts between 1900 and 1935. The lower cohort rates represent the dip in births during the depression years while the peak rates represent births in the post World War II period. There are indications that the 1940, 1945, 1950, and 1955 cohorts of women will show an ultimate fertility rate below the 1930, 1935 group. The fertility rate of these cohorts will mainly determine the 17-21 year old population in 1993-2000. Table 12 compares the current fertility rate for these cohorts to the fertility rate experienced by the birth cohort of 5 years earlier.

Table 12

Comparison of Current Fertility Rate for 1940, 45, 50, 55 Cohorts with Current Fertility Rate of Cohort 5 Years Earlier

	Cumulative Fertility Rates*		
Cohort	Up to Age 20	Up to Age 25	Up to Age 30
1935	387	1600	2529
1940	430	1592	2298
1945	362	1218	231
1950	280		

* Live births per 1000 women

The data shows for instance that for the 1935 age cohort of women, there were 2529 cumulative births per 1000 women up to age 30. For the 1940 cohort of women, there were only 2298 births per 1000 women through age 30.

Thus the 1940 cohort has experienced a 9 per cent reduction in births compared to the 1935 cohort. Comparing the 1940 to 1945 cohort, up to age 25, a 24 per cent reduction in births have occurred, while a 23 per cent reduction has occurred in the 1945 and 50 cohorts up to age 20. These reductions essentially illustrate the fertility behavior changes in the period 1965-1970. These lowered birth rates have continued through 1975. The ultimate completed fertility rates of women in these cohorts depends essentially on whether these reductions in births are simply delayed births or whether they represent permanent changes in fertility behavior. For projecting enlistments past 1990, we have chosen Series II (2.1 ultimate completed fertility rate) and Series III (1.7 ultimate completed fertility rate) Census projections for the following reasons. It is probable that certain causes of the declining birth rates such as availability of reliable contraceptives and the changing roles and aspirations of women are permanent and will continue to be reflected in fertility behavior. The current completed fertility rate of women who are primarily through their child bearing years, (1940 cohort) is 2.72. This group had available to them new, modern birth control methods and experienced a change of women's attitudes only during their latter child bearing years. Thus it is likely that completed fertility rates will dip further. The use of Series II and Series III projections seem to be a compromise between current fertility behavior (closer to Series III) and historical behavior (2.7) taking into account recent changes which probably are permanent.

Unemployment Assumptions

The unemployment projections used here are Congressional budget office projections for 1977-1980 (shown in Table 13). For after 1980 we have assumed two rates of 17.5 and 11.0 which represents the lowest and highest projected or actual annual rates in the 1970-1982 period. While unemployment rates will vary over the 1982-2000 period, we have tried to create bounds for the oscillation in enlistments due to unemployment rates.

Table 13

Projected Annual Unemployment Rates for 16-21 Year Old out of School Youths

1977	16.4
1978	15.1
1979	13.6
1980	12.3
1985-2000	11.0-17.5

Wage Assumptions

Over the long term, military wages are likely to keep pace with civilian wages of comparable groups. Legislated pay raises are aimed at comparability. However in recent years after the large pay increase, military wages have declined with respect to civilian wages of the order of 2 per cent annually. This due to Presidential pay caps on federal pay raises. Over the short run this technique may be used to continue this trend. However, we have assumed in our projection that military and civilian wages remain comparable at the 1976 level.

Projections

Projections are made only for enlistees who are high school graduates with Mental Categories I-III. These enlistees presently comprise over 50 percent of service accessions. Their quality and effectiveness as enlisted men are critical to the capability of each service. Significant declines in enlistment from this group mean drawing more enlistees from lower quality groups, youths who are non-high school graduates and in Mental Category IV. Lower quality groups have higher attrition rates, higher training costs, and inadequate performance in high skill jobs. Estimates of supply equations for lower quality groups are less accurate than those for higher quality groups because supply of youths from lower quality groups have generally been controlled by the Navy and DOD in the 1970-75 period.

The form of the equations used for the projections is

$$E_{ij} = 12\ P_j\ e^{a_i}\ \left(\frac{M_j}{C_j}\right)^{b_i}\ (U_j)^{c_i}$$

where

E_{ij} = annual enlistees in quality group i in year j

P_j = 17-21 year old civilian male population in year j

a_i = a constant determined by regression

M_j = military pay in year j

C_j = civilian wage in year j

b_i = pay elasticity

U_j = 16-21 year old (out of school) unemployment rate in year j

c_i = unemployment elasticity

Table 5 gives the estimated coefficients used for the projections of enlistment supply in this report.

Four scenarios were assumed for each enlistment group. They are:

1) Series III, high unemployment scenario

2) Series II, high unemployment scenario

3) Series III, low unemployment scenario

4) Series II, low unemployment scenario

Projected unemployment rates were used through 1980. For 1985-2000, a low and high unemployment curve is shown. The low and high unemployment scenarios provide bounds to enlistments for the 1985-2000 projections. For projections in 1995-2000, both Series II and Series III projections are shown. Figures 5-8 show the projection results. The figures are plotted to show the ratio of enlistments in the projection year to enlistments in 1976. The actual values are shown in Table 14. The projections show several interesting trends.

- If unemployment rates continue to decline in the 1976-1980 period, and unemployment rates oscillate between traditional high and low levels in the 1977-2000 time period, then the period of maximum quality enlistments in the 1975-2000 time period will be 1976-1977. The quality of enlistments during 1976-1977 has been better than during the draft period, so there is some room for declining quality and still remaining in the region of historical quality rates. As far as the volunteer force is concerned however, the peak of the quality is probably now.

- This projection model shows that high quality enlistments could dip by almost 40 percent in the 1995 time frame provided unemployment rates are low and Series III population projections are accurate (fertility rate of 1.7). The maximum drop predicted by this model is greater than would be shown by other enlistment models reviewed here, and should probably be considered as a conservative or low level limit estimate for planning purposes.

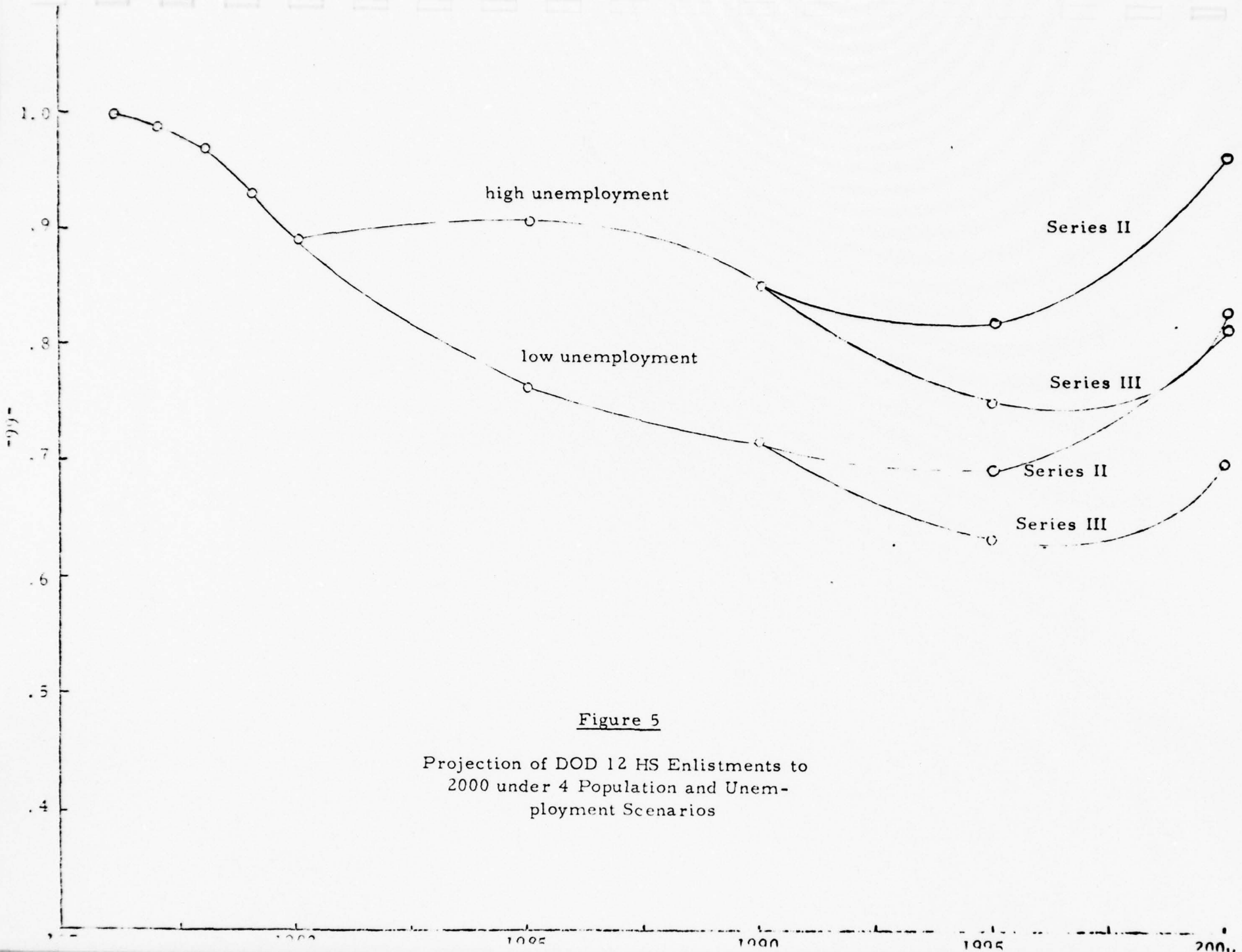


Figure 5

Projection of DOD 12 HS Enlistments to 2000 under 4 Population and Unemployment Scenarios

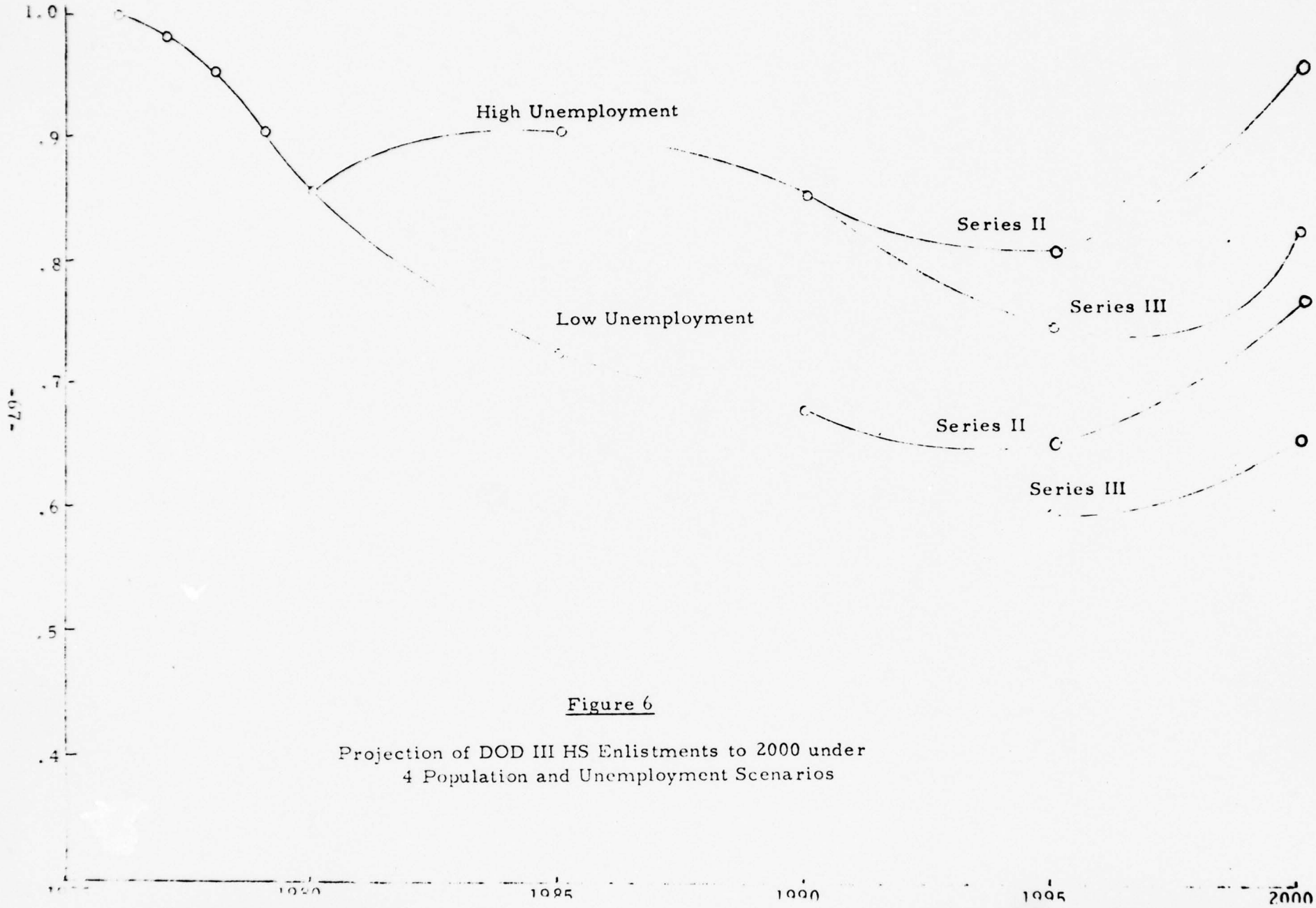


Figure 6

Projection of DOD III HS Enlistments to 2000 under
4 Population and Unemployment Scenarios

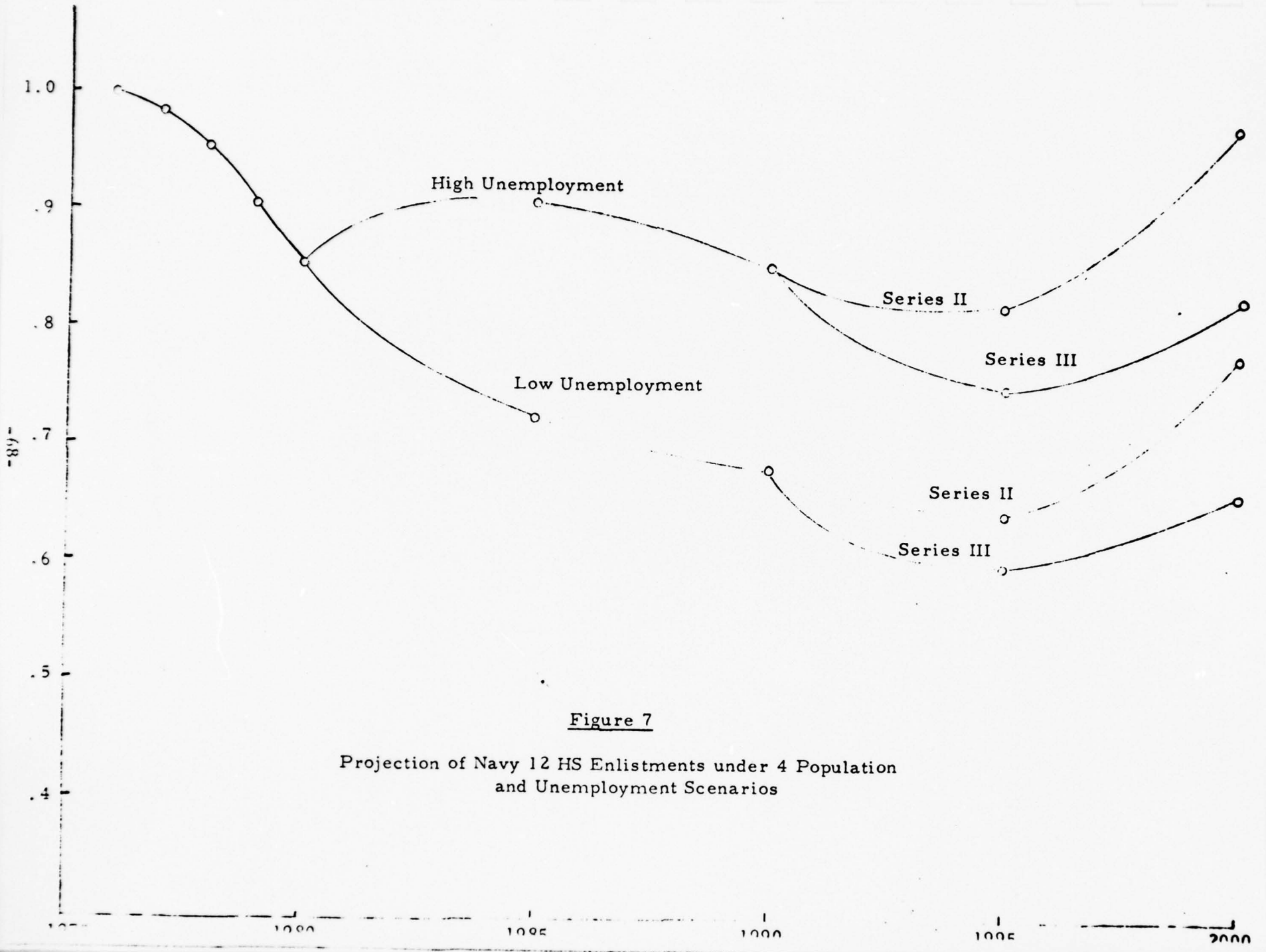


Figure 7

Projection of Navy 12 HS Enlistments under 4 Population and Unemployment Scenarios

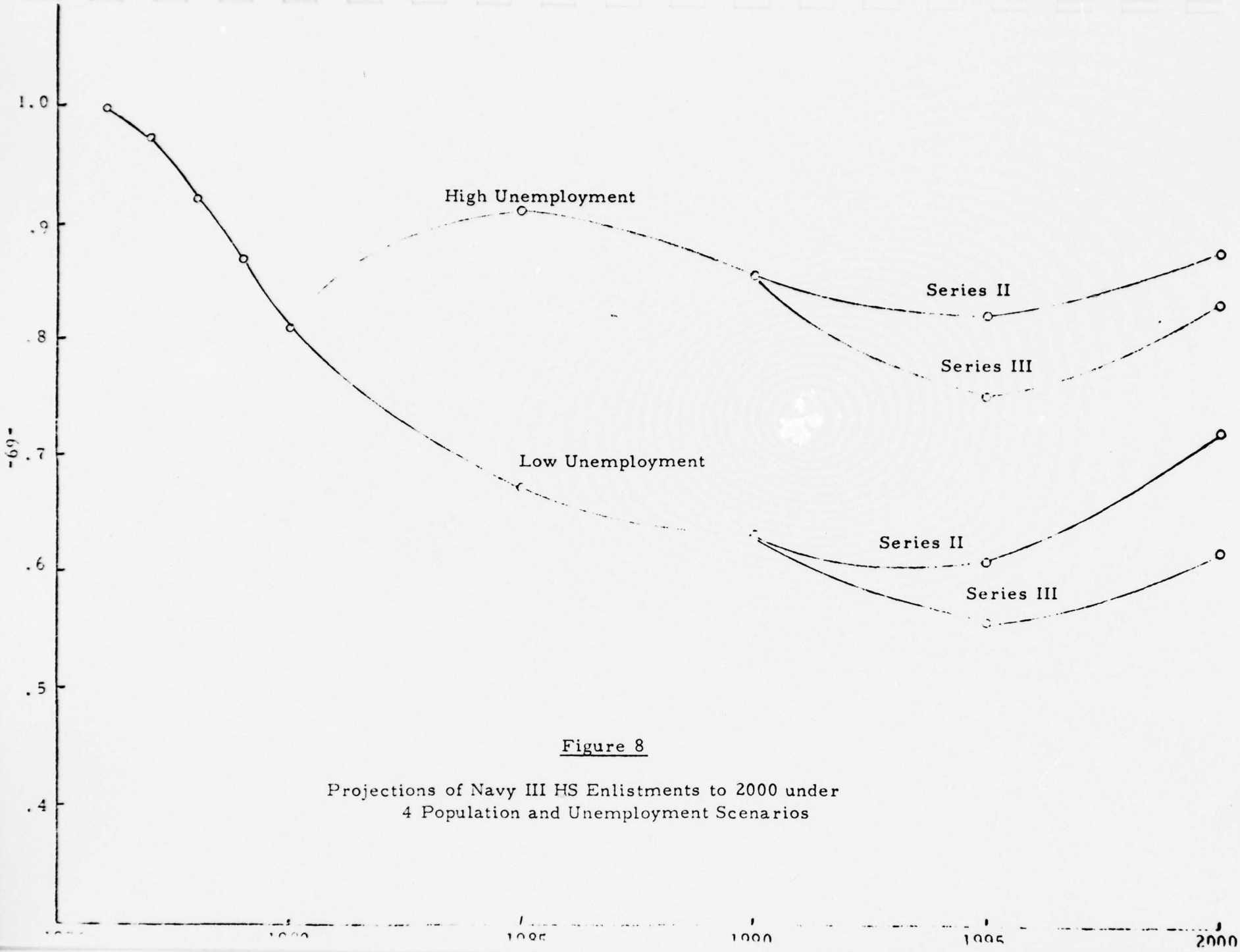


Figure 8

Projections of Navy III HS Enlistments to 2000 under
4 Population and Unemployment Scenarios

Table 14
Projection of Enlistments through 2000

	DOD 12 HS	DOD 3 HS	N 12 HS	N 3 HS
1977	.99	.98	.98	.97
1978	.97	.95	.95	.93
1979	.93	.91	.90	.87
1980	.89	.86	.86	.81
1985				
Low Unemploy.	.76	.73	.72	.67
High Unemploy.	.91	.91	.91	.91
1990				
Low Unemploy.	.72	.68	.68	.63
High Unemploy.	.85	.85	.85	.85
1995				
Low Unemploy.				
Series II	.69	.66	.65	.61
Series III	.63	.60	.60	.56
High Unemploy.				
Series II	.82	.82	.82	.82
Series III	.75	.75	.75	.75
2000				
Low Unemploy.				
Series II	.82	.78	.77	.72
Series III	.70	.66	.66	.61
High Unemploy.				
Series II	.97	.97	.97	.97
Series III	.83	.83	.83	.83

- Under all projections, the most vulnerable period for the volunteer force will be periods of low unemployment in the 1985-2000 time frame. Even under pessimistic population projection, population begins to rise again in 1995-2000 due to a second wave baby boom, and under more optimistic population assumptions the population rises rapidly in the 1995-2000 time frame.

- If unemployment declines according to current OMB projections, and if the historical relationship exists between general unemployment and youth unemployment, then CAT I-III HS enlistments for DOD and the Navy will decline by 1980 by 13 to 17 percent. This decline would bring quality indicators to more historical levels for the Navy and DOD. Declines of this magnitude are probably manageable.

- Periods of low youth unemployment during the 1982-1990 time frame will probably bring serious reappraisal of the volunteer force under current military manpower policies. This is partly due to the fact that shortfalls in high quality enlistments will fall unevenly in the services with the Army and Marine Corps probably feeling the effects first. At such time, manpower planners would be looking at least at a 5-15 year period of continually declining population. A return to the draft would look like an attractive option to many at this time. Universal service would also look more attractive than now as the population and the costs would fall in the 1985-1995 period. These options seem reasonable enough to include in long-range planning options.

- Should youth unemployment rates remain at relatively high historical levels due to the competition from the more populous and better trained 21-35 year old group during the 1985-2000 period, the largest estimated percentage decline in high quality enlistments would be 18 percent using Series II and 25 percent using Series III. Since these estimates represent lower level estimates, under tight youth labor market conditions, declines could probably be offset by somewhat lower quality and minor changes in manpower policies.

- The Navy is more affected by changes in unemployment than DOD enlistments as a whole. The Navy could experience wide swings in quality during the 1977-2000 period if unemployment rates oscillate between levels encountered in 1970-76. Sets of <u>counter cyclical military manpower policies</u> will probably be necessary to smooth quality input.

What are the options for sustaining an all-volunteer force in the face of possible serious declines in the traditional 17-21 year old male supply? The options can be grouped according to their effect on supply or demand. On the demand side, the options include:

1) smaller active force levels,

2) restructuring the force to require less accessions by increasing reenlistments,

3) substitution of capital for labor, and

4) civilianization of billets.

On the supply side, the options include:

1) increased use of women,

2) increased use of men in other age groups, prior service personnel, etc.,

3) relaxation of physical and/or mental standards, and

4) increased pay.

Smaller active force levels would of course arise from reduction in international tension, or reduction in overseas commitments. However, other options exist for smaller active forces. These include increased reliance on reserves and civilianizations of active force billets. Continued pursuit of the total force concept could bring active force level reductions while maintaining military strength. Civilian substitution has been ongoing since the start of the all-volunteer force and further active force reductions through civilianization may be possible.

Accession requirements could also be reduced by reducing personnel turnover through increased reenlistments. This, of course, would mean slower promotion rates and a greater percentage of careerists. Some enlisted men for instance may have to stay at a grade level for long periods of time, similar to some civilian manpower systems. The "up or out" policy basically would have to be changed to allow an increased percentage of reenlistments. However, cost/benefit tradeoffs would need to be made taking into account the increased returement costs of this approach. However, higher force levels could be maintained at lower accession levels through this approach.

Substitution of capital for labor includes design of weapons systems, logistics systems and management systems requiring less personnel. However this reduction in personnel may be offset by requiring more highly skilled personnel where supply is more limited. More highly capital intensive systems, while demanding less personnel, may also demand higher technical levels of competence. Since the higher qualified personnel are more costly to recruit and may be in short supply, a more comprehensive look at this approach is necessary.

On the supply side, the percentage of women in the services was around 2 percent in FY 71. The services now take in around 8 percent women in their accessions in FY 76 - FY 77. With greater experience in the use of women for traditionally male roles, this may be a viable option for maintaining the force. The number of women currently wanting

to enter is greater than the requirements. However, no good estimates are available for the total supply available if requirements were raised.

The traditional method of meeting requirements when high quality personnel are in short supply is to lower mental standards and to accept more prior service personnel. This can be done to a point. The supply of non-high school graduates and CAT IV personnel is much larger than has been previously tapped by the services. CAT IV personnel are currently running at less than 5 percent of enlistments. In the past this percentage has run over 15 percent. However, there is a cumulative spiraling effect associated with lower quality. Lower quality enlistees have higher turnover rates prior to end of service term. This has the effect of increasing accession requirements in the next years. Lower quality also means additional cost associated with training, which would put additional pressure on the manpower budget.

Across the board pay increases in order to increase supply is not feasible. Manpower budgets already comprise more than 1/2 of DOD spending, and is squeezing the amount spent on weapons. Pay raises are also a very inefficient way of increasing supply since pay increases would be made across the board for all personnel. However since higher quality enlistees may be in shortest supply, restructuring the pay system to one that is more civilianized would help. Pay would be increasingly based on market factors such as skill and education, thus allowing higher quality enlistees to earn more without raising pay for the entire force.

Reduction of physical standards would provide a limited increase in manpower supply, but would have less impact on increasing the supply of higher qualified enlistees.

Finally, a partial alternative to increasing the supply is to achieve a more effective overall force level through selective initiatives by each service that have the effect of balancing the supply of enlistees among services. This is already done by use of bonuses and allocation of the advertising and recruiting budgets. However, more could be done to more evenly distribute possible shortfalls across services and avoid the feast or famine situation for individual services.

CHAPTER 5

MANPOWER SUPPLY AND NAVY PLANNING

Two emerging trends appear likely to make manpower perhaps the critical issue for defense in the next 8 years. The first trend is the well documented rising cost of manpower. Manpower-related costs now comprise about 55 percent of the DOD budget, and it is likely to take major changes in manpower policies to reduce this percentage. The second trend is the supply of highly qualified enlistees is likely to decline beginning around FY 78 with substantial reductions occurring in the 1985-1995 time period. This decline could bring 30-40 percent reduction from current levels. This decline will certainly bring new pressure on manpower budgets, especially if the all-volunteer policy is continued. The two trends of rising costs and declining supply will certainly bring a reevaluation of the all-volunteer concept. Projections made earlier in this report show that serious shortfalls could occur as early as FY 85 with larger shortfalls expected in the FY 87 - FY 95 period. What is important to realize however, is that long-range planning can probably avert impacts due to the projected declines. However, there is very little that can be done in the short run once quality declines have taken place in response to declines of this magnitude other than returning to a draft. Our commitment to maintain a strong-all-volunteer force may thus revolve

around our commitment to sound long-range planning. Such long-range planning is traditionally done by the services for weapon systems. However, long-range planning for manpower is virtually nonexistent in DOD. A commitment to the all-volunteer concept means that personnel is treated as a supply limited item and planning must be done within the realistic constraints of what is to be available. This means that weapon systems design, capital outlays for facilities, force level planning and structuring must all be done within manpower supply constraints. The weapon system "design to cost" philosophy will also have to include "design to manpower." Failure to integrate manpower planning into these other crucial decisions will probably mean that no alternatives are left but to return to a draft system, probably as early as 1985.

Most of the current manpower and personnel organization is concerned with short range planning (0-5 years) and meeting requirements in this time frame. The organization of this part of the manpower system will probably not be impacted specifically by the supply question immediately since major shortfalls are probably 5-10 years away. However what is critical is that more organizational resources be devoted to long-range manpower planning. Basically a long-term manpower plan needs to be developed for manning the services. This plan would consider all the options available, including returning to the draft, and make recommendations for manning in the 5-20 year time frame. This long-term manpower

plan would then need to be integrated into all weapons system planning, force level and structuring planning in order to produce a viable defense plan incorporating manpower constraints.

Research areas which need increasing attention include the following:

1) Supply estimation for women

2) Substitutability of women for men

3) Capital/labor tradeoffs

4) Civilian substitution for military

5) Dynamics of the youth labor market

6) Long-term supply projection

7) Mental, physical standards cost/benefit analysis

8) Life cycle manpower costing

9) Integration of manpower and weapon systems planning

Research in the area of military service for women should concentrate both on supply and substitution possibilities. Actual performance of women from experience of other countries (Israel) as well as current U.S. experience must be monitored carefully. Supply estimates must concentrate on high mental category groups since severe demand limitation has been in effect for women since the start of the all volunteer force.

It is clear also that a critical research area is the area of interaction of the civilian labor market, educational market and military labor market.

Many models exist for short-term projections, however, our understanding of the effect of many factors which have long-term effects is sparse. Also, the dynamics of the youth labor market needs further explanation. Basically the military labor market needs to be put in the context of the national labor market so that impacts of changes in the national labor force and economy can be estimated. More research emphasis should be given to microsimulation models of the youth market, and models of the national labor force that include military manpower as a separable element.

APPENDIX A

Regression Data

Payratio Variable for DOD Enlistees

PAYRATIO	70	1	.9030
PAYRATIO	70	2	.8815
PAYRATIO	70	3	.8903
PAYRATIO	70	4	.8737
PAYRATIO	70	5	.9603
PAYRATIO	70	6	.9499
PAYRATIO	70	7	.9421
PAYRATIO	70	8	.8427
PAYRATIO	70	9	.9456
PAYRATIO	70	10	.9455
PAYRATIO	70	11	.9492
PAYRATIO	70	12	.9509
PAYRATIO	71	1	.9776
PAYRATIO	71	2	.9310
PAYRATIO	71	3	.8950
PAYRATIO	71	4	.8943
PAYRATIO	71	5	.9877
PAYRATIO	71	6	.8935
PAYRATIO	71	7	.9319
PAYRATIO	71	8	.8871
PAYRATIO	71	9	.8757
PAYRATIO	71	10	.8583
PAYRATIO	71	11	1.0514
PAYRATIO	71	12	1.0427
PAYRATIO	72	1	1.1732
PAYRATIO	72	2	1.1535
PAYRATIO	72	3	1.1501
PAYRATIO	72	4	1.1489
PAYRATIO	72	5	1.1335
PAYRATIO	72	6	1.1160
PAYRATIO	72	7	1.1135
PAYRATIO	72	8	1.1101
PAYRATIO	72	9	1.1033
PAYRATIO	72	10	1.0932
PAYRATIO	72	11	1.0900
PAYRATIO	72	12	1.0712
PAYRATIO	73	1	1.1261
PAYRATIO	73	2	1.1170
PAYRATIO	73	3	1.1282
PAYRATIO	73	4	1.0967
PAYRATIO	73	5	1.0992
PAYRATIO	73	6	1.0737
PAYRATIO	73	7	1.0590
PAYRATIO	73	8	1.0511
PAYRATIO	73	9	1.0534
PAYRATIO	73	10	1.0305
PAYRATIO	73	11	1.0427
PAYRATIO	73	12	1.0749
PAYRATIO	74	1	1.0659
PAYRATIO	74	2	1.0582
PAYRATIO	74	3	1.0309
PAYRATIO	74	4	1.0424
PAYRATIO	74	5	1.0751
PAYRATIO	74	6	1.0382
PAYRATIO	74	7	1.0213
PAYRATIO	74	8	1.0151
PAYRATIO	74	9	1.0235
PAYRATIO	74	10	1.0377
PAYRATIO	74	11	1.0519
PAYRATIO	74	12	1.0463
PAYRATIO	75	1	1.0408
PAYRATIO	75	2	1.0345
PAYRATIO	75	3	1.0293
PAYRATIO	75	4	1.0234
PAYRATIO	75	5	1.0179
PAYRATIO	75	6	1.0125
PAYRATIO	75	7	1.0071
PAYRATIO	75	8	1.0017
PAYRATIO	75	9	.9964
PAYRATIO	75	10	1.0421
PAYRATIO	75	11	1.0363
PAYRATIO	75	12	1.0311
PAYRATIO	76	1	1.0246

This variable represents the military-civilian pay ratio for all DOD volunteers. The estimate was computed as the ratio of the average RMC across services to the median income of 18-21 year-old male civilians.

NAVPQS Average RMC Variable for Navy Enlistees

NAVPQS			
NAVPQS	1	70	3986.
NAVPQS	2	70	3986.
NAVPQS	3	70	3986.
NAVPQS	4	70	3986.
NAVPQS	5	70	3986.
NAVPQS	6	70	3986.
NAVPQS	7	70	3986.
NAVPQS	8	70	3986.
NAVPQS	9	70	3986.
NAVPQS	10	70	3971.
NAVPQS	11	70	3971.
NAVPQS	12	70	3971.
NAVPQS	1	71	4074.
NAVPQS	2	71	4074.
NAVPQS	3	71	4074.
NAVPQS	4	71	4059.
NAVPQS	5	71	4059.
NAVPQS	6	71	4059.
NAVPQS	7	71	4043.
NAVPQS	8	71	4043.
NAVPQS	9	71	4043.
NAVPQS	10	71	4043.
NAVPQS	11	71	4993.
NAVPQS	12	71	4993.
NAVPQS	1	72	5720.
NAVPQS	2	72	5720.
NAVPQS	3	72	5720.
NAVPQS	4	72	5705.
NAVPQS	5	72	5705.
NAVPQS	6	72	5705.
NAVPQS	7	72	5694.
NAVPQS	8	72	5694.
NAVPQS	9	72	5694.
NAVPQS	10	72	5647.
NAVPQS	11	72	5647.
NAVPQS	12	72	5647.
NAVPQS	1	73	6037.
NAVPQS	2	73	6037.
NAVPQS	3	73	6037.
NAVPQS	4	73	6031.
NAVPQS	5	73	6031.
NAVPQS	6	73	6031.
NAVPQS	7	73	6024.
NAVPQS	8	73	6024.
NAVPQS	9	73	6024.
NAVPQS	10	73	6282.
NAVPQS	11	73	6282.
NAVPQS	12	73	6282.
NAVPQS	1	74	6275.
NAVPQS	2	74	6275.
NAVPQS	3	74	6275.
NAVPQS	4	74	6267.
NAVPQS	5	74	6267.
NAVPQS	6	74	6267.
NAVPQS	7	74	6267.
NAVPQS	8	74	6267.
NAVPQS	9	74	6267.
NAVPQS	10	74	6643.
NAVPQS	11	74	6643.
NAVPQS	12	74	6643.
NAVPQS	1	75	6643.
NAVPQS	2	75	6643.
NAVPQS	3	75	6643.
NAVPQS	4	75	6643.
NAVPQS	5	75	6643.
NAVPQS	6	75	6643.
NAVPQS	7	75	6643.
NAVPQS	8	75	6643.
NAVPQS	9	75	6643.
NAVPQS	10	75	6975.
NAVPQS	11	75	6975.
NAVPQS	12	75	6975.
NAVPQS	1	76	6975.

This variable represents the average RMC for Navy volunteers. It was derived by taking the average of the NVPQS1, NVPQS2, and NVPQS3 variables which represent the RMC for less than 2 years, 2-3 years, and 3-4 years in service, respectively. The series represents RMC average over pay grades E1-E6.

DUNEMP-T Deseasonalized Unemployment Rate for 16-21 Year Old Males

DUNEMP-T	70	1	8.1200
DUNEMP-T	70	2	8.6200
DUNEMP-T	70	3	8.5300
DUNEMP-T	70	4	8.5000
DUNEMP-T	70	5	10.0200
DUNEMP-T	70	6	11.0100
DUNEMP-T	70	7	12.7400
DUNEMP-T	70	8	12.3200
DUNEMP-T	70	9	11.0100
DUNEMP-T	70	10	13.1000
DUNEMP-T	70	11	12.0500
DUNEMP-T	70	12	12.7000
DUNEMP-T	71	1	12.9000
DUNEMP-T	71	2	12.1000
DUNEMP-T	71	3	11.0000
DUNEMP-T	71	4	9.4700
DUNEMP-T	71	5	11.9300
DUNEMP-T	71	6	13.0000
DUNEMP-T	71	7	13.3100
DUNEMP-T	71	8	13.2100
DUNEMP-T	71	9	12.2300
DUNEMP-T	71	10	13.1000
DUNEMP-T	71	11	13.3000
DUNEMP-T	71	12	13.2300
DUNEMP-T	72	1	13.1600
DUNEMP-T	72	2	12.6300
DUNEMP-T	72	3	12.2300
DUNEMP-T	72	4	12.5000
DUNEMP-T	72	5	11.8300
DUNEMP-T	72	6	11.4500
DUNEMP-T	72	7	11.9300
DUNEMP-T	72	8	12.5400
DUNEMP-T	72	9	11.3400
DUNEMP-T	72	10	11.2200
DUNEMP-T	72	11	11.0300
DUNEMP-T	72	12	10.9000
DUNEMP-T	73	1	9.5500
DUNEMP-T	73	2	9.9300
DUNEMP-T	73	3	9.3300
DUNEMP-T	73	4	9.8500
DUNEMP-T	73	5	9.8200
DUNEMP-T	73	6	10.0000
DUNEMP-T	73	7	10.8400
DUNEMP-T	73	8	10.5300
DUNEMP-T	73	9	10.7400
DUNEMP-T	73	10	9.5000
DUNEMP-T	73	11	10.8000
DUNEMP-T	73	12	10.0500
DUNEMP-T	74	1	9.9200
DUNEMP-T	74	2	9.9300
DUNEMP-T	74	3	10.5300
DUNEMP-T	74	4	10.5400
DUNEMP-T	74	5	10.2700
DUNEMP-T	74	6	11.6200
DUNEMP-T	74	7	12.0700
DUNEMP-T	74	8	12.5400
DUNEMP-T	74	9	13.9600
DUNEMP-T	74	10	13.9700
DUNEMP-T	74	11	14.4400
DUNEMP-T	74	12	14.6100
DUNEMP-T	75	1	15.5000
DUNEMP-T	75	2	15.6000
DUNEMP-T	75	3	17.4500
DUNEMP-T	75	4	17.9600
DUNEMP-T	75	5	19.0400
DUNEMP-T	75	6	19.5000
DUNEMP-T	75	7	17.4000
DUNEMP-T	75	8	17.7000
DUNEMP-T	75	9	18.6000
DUNEMP-T	75	10	17.9000
DUNEMP-T	75	11	17.7000
DUNEMP-T	75	12	15.7000
DUNEMP-T	76	1	17.9000

This variable represents the seasonally adjusted unemployment rate of 16-21 year old males in the total (16-21 year old) labor force. The total labor force includes those 16-21 year old males whose major activity is other than going to school and those in the military of the same age.

DOD12HS DOD Category 1, 2 High School Graduate Volunteers

```
DOD12HS
DOD12HS      7   70   6152.
DOD12HS      8   70   5965.
DOD12HS      9   70   5602.
DOD12HS     10   70   5415.
DOD12HS     11   70   4707.
DOD12HS     12   70   3765.
DOD12HS      1   71   5483.
DOD12HS      2   71   4887.
DOD12HS      3   71   4693.
DOD12HS      4   71   3775.
DOD12HS      5   71   7313.
DOD12HS      6   71   7331.
DOD12HS      7   71   7274.
DOD12HS      8   71   8255.
DOD12HS      9   71   7613.
DOD12HS     10   71   6477.
DOD12HS     11   71   5194.
DOD12HS     12   71   4500.
DOD12HS      1   72   6710.
DOD12HS      2   72   5389.
DOD12HS      3   72   5061.
DOD12HS      4   72   4487.
DOD12HS      5   72   4440.
DOD12HS      6   72   8700.
DOD12HS      7   72   8659.
DOD12HS      8   72   9634.
DOD12HS      9   72   8449.
DOD12HS     10   72   7514.
DOD12HS     11   72   6593.
DOD12HS     12   72   4696.
DOD12HS      1   73   7339.
DOD12HS      2   73   6201.
DOD12HS      3   73   5409.
DOD12HS      4   73   4275.
DOD12HS      5   73   4688.
DOD12HS      6   73  10737.
DOD12HS      7   73   8206.
DOD12HS      8   73   9065.
DOD12HS      9   73   8035.
DOD12HS     10   73   7327.
DOD12HS     11   73   5740.
DOD12HS     12   73   4214.
DOD12HS      1   74   8497.
DOD12HS      2   74   6577.
DOD12HS      3   74   6014.
DOD12HS      4   74   4763.
DOD12HS      5   74   4505.
DOD12HS      6   74  10080.
DOD12HS      7   74   7432.
DOD12HS      8   74   8240.
DOD12HS      9   74   6464.
DOD12HS     10   74   6041.
DOD12HS     11   74   6400.
DOD12HS     12   74   4479.
DOD12HS      1   75   8869.
DOD12HS      2   75   7303.
DOD12HS      3   75   6776.
DOD12HS      4   75   5489.
DOD12HS      5   75   8177.
DOD12HS      6   75  14015.
DOD12HS      7   75  10972.
DOD12HS      8   75  12357.
DOD12HS      9   75   8866.
DOD12HS     10   75   8560.
DOD12HS     11   75   7474.
DOD12HS     12   75   7114.
DOD12HS      1   76   8293.
END
```

This variable is the GRC estimate of total Mental Category 1-2 male high school graduate volunteers to all four services. The series was computed as the sum of the estimates for this category 1-2 high school group for each service.

N12HS Navy True Volunteers, Category 1,2 who are High School Grads

N12HS	- NAVY TRUE VOLT CAT 1,2 WHO ARE HIGH SCHO.. [illegible]		
N12HS	7	70	1969.
N12HS	8	70	1866.
N12HS	9	70	1476.
N12HS	10	70	1515.
N12HS	11	70	1701.
N12HS	12	70	957.
N12HS	1	71	1775.
N12HS	2	71	1657.
N12HS	3	71	1409.
N12HS	4	71	1017.
N12HS	5	71	748.
N12HS	6	71	1880.
N12HS	7	71	2325.
N12HS	8	71	3101.
N12HS	9	71	2237.
N12HS	10	71	2379.
N12HS	11	71	1813.
N12HS	12	71	1119.
N12HS	1	72	2162.
N12HS	2	72	1767.
N12HS	3	72	1429.
N12HS	4	72	1026.
N12HS	5	72	1047.
N12HS	6	72	2375.
N12HS	7	72	2613.
N12HS	8	72	3219.
N12HS	9	72	3075.
N12HS	10	72	2051.
N12HS	11	72	1976.
N12HS	12	72	1407.
N12HS	1	73	1705.
N12HS	2	73	1451.
N12HS	3	73	1623.
N12HS	4	73	1347.0
N12HS	5	73	1255.0
N12HS	6	73	2656.
N12HS	7	73	2577.
N12HS	8	73	2831.
N12HS	9	73	2905.
N12HS	10	73	2255.
N12HS	11	73	1747.
N12HS	12	73	1244.
N12HS	1	74	2697.
N12HS	2	74	2007.
N12HS	3	74	1812.
N12HS	4	74	1517.
N12HS	5	74	1411.
N12HS	6	74	3112.
N12HS	7	74	2724.
N12HS	8	74	2956.
N12HS	9	74	3048.
N12HS	10	74	2826.
N12HS	11	74	2342.
N12HS	12	74	1587.
N12HS	1	75	2678.
N12HS	2	75	2291.
N12HS	3	75	2212.
N12HS	4	75	2045.
N12HS	5	75	2254.
N12HS	6	75	3965.
N12HS	7	75	3271.
N12HS	8	75	3316.
N12HS	9	75	2222.
N12HS	10	75	2789.
N12HS	11	75	2244.
N12HS	12	75	2193.
N12HS	1	75	2443.

This time series is the number of Mental Category I, II Navy volunteers who are diploma high school graduates as estimated for the period January 1970-May 1974 by the GRC maximum mehtod that includes 100 percent of the men without lottery sequence numbers as volunteers. For June 1974-June 1975, source of the data is the USAREC Report RCS: USARCRO 36, "Supplemental Enlistment Option Report."

UNEMPL1 Unemployment Rate among 16-21 out of school Labor Force

	IN021	70	1	4804.0000
	IN021	70	2	4561.8000
	IN021	70	3	4514.8000
	IN021	70	4	4579.6000
	IN021	70	5	4735.8000
	IN021	70	6	4795.7000
	IN021	70	7	4851.6000
	IN021	70	8	4836.6000
	IN021	70	9	4821.6000
	IN021	70	10	4806.4000
	IN021	70	11	4791.7000
	IN021	70	12	4776.3000
	IN021	71	1	4751.2000
	IN021	71	2	4757.2000
	IN021	71	3	4731.0000
	IN021	71	4	4716.0000
	IN021	71	5	4703.8000
	IN021	71	6	4695.6000
	IN021	71	7	4670.7000
	IN021	71	8	4711.6000
	IN021	71	9	4751.6000
	IN021	71	10	4792.1000
	IN021	71	11	4832.5000
	IN021	71	12	4873.1000
	IN021	72	1	4913.5000
	IN021	72	2	4954.0000
	IN021	72	3	4994.4000
	IN021	72	4	5034.9000
	IN021	72	5	5075.4000
	IN021	72	6	5102.6000
	IN021	72	7	5156.4000
	IN021	72	8	5200.2000
	IN021	72	9	5243.7000
	IN021	72	10	5287.6000
	IN021	72	11	5331.3000
	IN021	72	12	5375.1000
	IN021	73	1	5418.9000
	IN021	73	2	5462.7000
	IN021	73	3	5506.3000
	IN021	73	4	5550.1000
	IN021	73	5	5593.8000
	IN021	73	6	5637.6000
	IN021	73	7	5681.3000
	IN021	73	8	5724.0000
	IN021	73	9	5765.0000
	IN021	73	10	5803.0000
	IN021	73	11	5840.0000
	IN021	73	12	5878.0000
	IN021	74	1	5915.0000
	IN021	74	2	5953.0000
	IN021	74	3	6000.0000
	IN021	74	4	6042.0000
	IN021	74	5	6085.0000
	IN021	74	6	6127.0000
	IN021	74	7	6169.0000
	IN021	74	8	6211.0000
	IN021	74	9	6253.0000
	IN021	74	10	6295.0000
	IN021	74	11	6337.0000
	IN021	74	12	6379.0000
	IN021	75	1	6420.0000
	IN021	75	2	6462.0000
	IN021	75	3	6471.0000
	IN021	75	4	6505.0000
	IN021	75	5	6541.0000
	IN021	75	6	6577.0000
	IN021	75	7	6613.0000
	IN021	75	8	6647.0000
	IN021	75	9	6681.0000
	IN021	75	10	6714.0000
	IN021	75	11	6747.0000
	IN021	75	12	6780.0000
	IN021	75	1	6813.0000

This time series is the unemployment rate for 16-21 year old, male civilian labor force whose major activity was other than going to school. The source of the data is the table, Employment Status of the Noninstitutional Population 16-21 Years of Age by Color and Sex, in the U.S. Department of Labor, BLS, monthly Employment and Earnings.

DOD Pay Average RMC Variable for DOD Enlistees

DODPAY	70	1	4367.0000
DODPAY	70	2	4367.0000
DODPAY	70	3	4367.0000
DODPAY	70	4	4374.0000
DODPAY	70	5	4374.0000
DODPAY	70	6	4374.0000
DODPAY	70	7	4375.0000
DODPAY	70	8	4375.0000
DODPAY	70	9	4375.0000
DODPAY	70	10	4384.0000
DODPAY	70	11	4384.0000
DODPAY	70	12	4384.0000
DODPAY	71	1	4387.0000
DODPAY	71	2	4387.0000
DODPAY	71	3	4387.0000
DODPAY	71	4	4393.0000
DODPAY	71	5	4393.0000
DODPAY	71	6	4393.0000
DODPAY	71	7	4391.0000
DODPAY	71	8	4391.0000
DODPAY	71	9	4391.0000
DODPAY	71	10	4391.0000
DODPAY	71	11	5391.0000
DODPAY	71	12	5391.0000
DODPAY	72	1	5394.0000
DODPAY	72	2	5394.0000
DODPAY	72	3	5394.0000
DODPAY	72	4	5394.0000
DODPAY	72	5	5394.0000
DODPAY	72	6	5394.0000
DODPAY	72	7	5393.0000
DODPAY	72	8	5393.0000
DODPAY	72	9	5393.0000
DODPAY	72	10	5358.0000
DODPAY	72	11	5358.0000
DODPAY	72	12	5358.0000
DODPAY	73	1	5402.0000
DODPAY	73	2	5402.0000
DODPAY	73	3	5402.0000
DODPAY	73	4	5387.0000
DODPAY	73	5	5387.0000
DODPAY	73	6	5387.0000
DODPAY	73	7	5374.0000
DODPAY	73	8	5374.0000
DODPAY	73	9	5374.0000
DODPAY	73	10	5334.0000
DODPAY	73	11	5334.0000
DODPAY	73	12	5334.0000
DODPAY	74	1	5326.0000
DODPAY	74	2	5326.0000
DODPAY	74	3	5326.0000
DODPAY	74	4	5319.0000
DODPAY	74	5	5319.0000
DODPAY	74	6	5319.0000
DODPAY	74	7	5319.0000
DODPAY	74	8	5319.0000
DODPAY	74	9	5319.0000
DODPAY	74	10	5359.0000
DODPAY	74	11	5359.0000
DODPAY	74	12	5359.0000
DODPAY	75	1	5359.0000
DODPAY	75	2	5359.0000
DODPAY	75	3	5359.0000
DODPAY	75	4	5359.0000
DODPAY	75	5	5359.0000
DODPAY	75	6	5359.0000
DODPAY	75	7	5359.0000
DODPAY	75	8	5359.0000
DODPAY	75	9	5359.0000
DODPAY	75	10	5391.0000
DODPAY	75	11	5391.0000
DODPAY	75	12	5391.0000
DODPAY	75	1	5391.0000

DODPAY is an estimate of the average RMC for all DOD volunteers. It was derived as the average of the average RMC's across services. The variable represents the basic pay, quarters and subsistence allowances and the tax advantage on these allowances all averaged over pay grades E1-E6 from 0-4 years of service.

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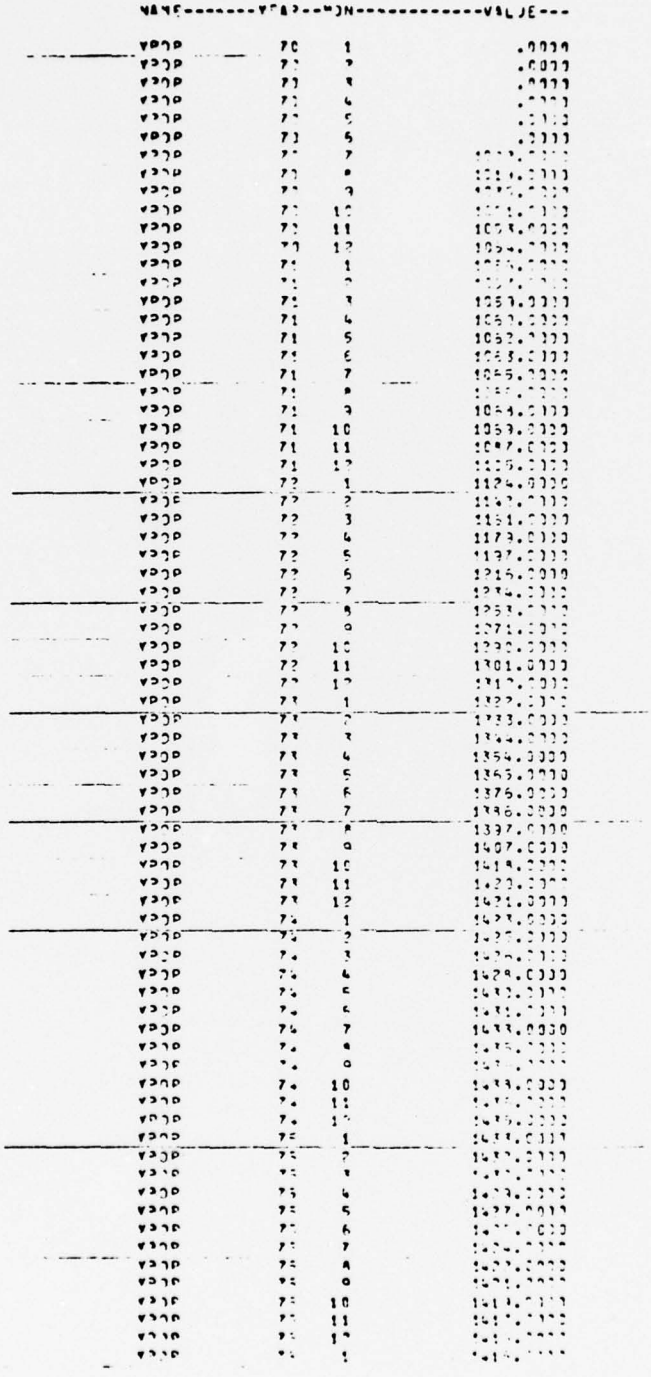
DDC

17-19 Year Old High School Graduates Not in School



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VP3P	70	3	.0000
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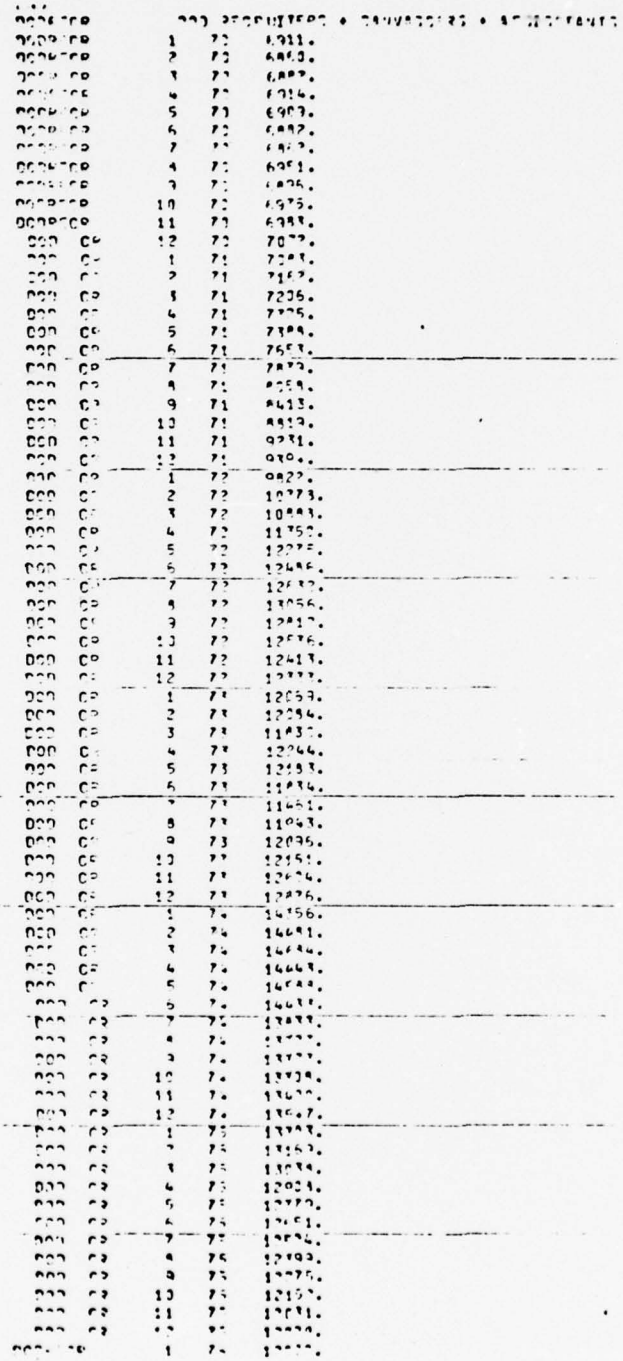
VP3P	70	5	.0000
VP3P	70	6	.0000
VP3P	70	7	[illegible]
VP3P	70	8	1011.0000
VP3P	70	9	[illegible]
VP3P	70	10	[illegible]
VP3P	70	11	1054.0000
VP3P	70	12	1094.0000
VP3P	71	1	[illegible]
VP3P	71	2	[illegible]
VP3P	71	3	1051.0000
VP3P	71	4	1067.0000
VP3P	71	5	1062.0000
VP3P	71	6	1058.0000
VP3P	71	7	1065.0000
VP3P	71	8	[illegible]
VP3P	71	9	1064.0000
VP3P	71	10	1063.0000
VP3P	71	11	1047.0000
VP3P	71	12	1126.0000
VP3P	72	1	1124.0000
VP3P	72	2	[illegible]
VP3P	72	3	1161.0000
VP3P	72	4	1173.0000
VP3P	72	5	1197.0000
VP3P	72	6	1216.0000
VP3P	72	7	1234.0000
VP3P	72	8	1253.0000
VP3P	72	9	1271.0000
VP3P	72	10	1290.0000
VP3P	72	11	1301.0000
VP3P	72	12	1317.0000
VP3P	73	1	1322.0000
VP3P	73	2	1333.0000
VP3P	73	3	1344.0000
VP3P	73	4	1354.0000
VP3P	73	5	1363.0000
VP3P	73	6	1376.0000
VP3P	73	7	1386.0000
VP3P	73	8	1397.0000
VP3P	73	9	1407.0000
VP3P	73	10	1418.0000
VP3P	73	11	1423.0000
VP3P	73	12	1431.0000
VP3P	74	1	1423.0000
VP3P	74	2	1425.0000
VP3P	74	3	[illegible]
VP3P	74	4	1429.0000
VP3P	74	5	[illegible]
VP3P	74	6	[illegible]
VP3P	74	7	1433.0000
VP3P	74	8	[illegible]
VP3P	74	9	[illegible]
VP3P	74	10	1438.0000
VP3P	74	11	[illegible]
VP3P	74	12	[illegible]
VP3P	75	1	1434.0000
VP3P	75	2	1437.0000
VP3P	75	3	[illegible]
VP3P	75	4	[illegible]
VP3P	75	5	[illegible]
VP3P	75	6	[illegible]
VP3P	75	7	[illegible]
VP3P	75	8	[illegible]
VP3P	75	9	[illegible]
VP3P	75	10	[illegible]
VP3P	75	11	[illegible]
VP3P	75	12	[illegible]
VP3P	76	1	[illegible]

This is the total number of 17-19 year old high school graduates who are not in school. Source is the Current Population reports, Series P-20, No. 303, 286, 278, 272, 261, 247, 234, 222.

DOD Recruiters, Canvassers and Assistants



This is the total number of production recruiters, canvassers and recruiter assistants for all services.

Navy Recruiters on Production

[illegible]	NUMBER	OF	RECRUITERS ON PRODUCTION IN NAVY
PEQP NAV	1	73	2004.
PEQP NAV	2	73	1952.
PEQP NAV	3	73	1984.
PEQP NAV	4	73	1997.
PEQP NAV	5	73	2003.
PEQP NAV	6	73	1995.
PEQP NAV	7	73	1979.
PEQP NAV	8	73	2022.
PEQP NAV	9	73	2021.
PEQP NAV	10	73	2001.
PEQP NAV	11	73	2005.
PEQP NAV	12	73	2107.
PEQP NAV	1	74	2034.
PEQP NAV	2	74	2072.
PEQP NAV	3	74	2099.
PEQP NAV	4	74	2081.
PEQP NAV	5	74	2087.
PEQP NAV	6	74	2079.
PEQP NAV	7	74	2079.
PEQP NAV	8	74	2056.
PEQP NAV	9	74	2090.
PEQP NAV	10	74	2122.
PEQP NAV	11	74	2193.
PEQP NAV	12	74	2213.
PEQP NAV	1	75	2259.
PEQP NAV	2	75	2372.
PEQP NAV	3	75	2473.
PEQP NAV	4	75	2549.
PEQP NAV	5	75	2693.
PEQP NAV	6	75	2751.
PEQP NAV	7	75	2875.
PEQP NAV	8	75	3105.
PEQP NAV	9	75	3223.
PEQP NAV	10	75	3320.
PEQP NAV	11	75	3344.
PEQP NAV	12	75	3321.
PEQP NAV	1	76	3322.
PEQP NAV	2	76	3314.
PEQP NAV	3	76	3295.
PEQP NAV	4	76	3502.
PEQP NAV	5	76	3490.
PEQP NAV	6	76	3453.
PEQP NAV	7	76	3372.
PEQP NAV	8	76	3364.
PEQP NAV	9	76	3211.
PEQP NAV	10	76	3197.
PEQP NAV	11	76	3206.
PEQP NAV	12	76	3205.
PEQP NAV	1	77	3623.
PEQP NAV	2	77	3699.
PEQP NAV	3	77	3683.
PEQP NAV	4	77	3619.
PEQP NAV	5	77	3647.
PEQP NAV	6	77	3622.
PEQPNAV	7	77	3669.
PEQPNAV	8	77	3710.
PEQPNAV	9	77	3707.
PEQPNAV	10	77	3687.
PEQPNAV	11	77	3694.
PEQPNAV	12	77	3695.
PEQPNAV	1	78	3719.
PEQPNAV	2	78	3677.
PEQPNAV	3	78	3701.
PEQPNAV	4	78	3641.
PEQPNAV	5	78	3665.
PEQPNAV	6	78	3649.
PEQPNAV	7	78	3699.
PEQPNAV	8	78	3640.
PEQPNAV	9	78	3640.
PEQPNAV	10	78	3658.
PEQPNAV	11	78	3629.
PEQPNAV	12	78	3704.
PEQPNAV	1	79	3704.

This is the number of Navy recruiters on production during each month.

DOD3HS DOD Category 3 High School Graduate Volunteers

END			
DOD3HS			
DOD3HS	7	70	6529.
DOD3HS	8	70	6729.
DOD3HS	9	70	5667.
DOD3HS	10	70	5163.
DOD3HS	11	70	4431.
DOD3HS	12	70	3957.
DOD3HS	1	71	5633.
DOD3HS	2	71	5068.
DOD3HS	3	71	5284.
DOD3HS	4	71	4100.
DOD3HS	5	71	3518.
DOD3HS	6	71	9692.
DOD3HS	7	71	9194.
DOD3HS	8	71	10053.
DOD3HS	9	71	9154.
DOD3HS	10	71	7432.
DOD3HS	11	71	6030.
DOD3HS	12	71	5453.
DOD3HS	1	72	7192.
DOD3HS	2	72	5692.
DOD3HS	3	72	5295.
DOD3HS	4	72	4948.
DOD3HS	5	72	5784.
DOD3HS	6	72	12140.
DOD3HS	7	72	11834.
DOD3HS	8	72	11439.
DOD3HS	9	72	11174.
DOD3HS	10	72	8820.
DOD3HS	11	72	7417.
DOD3HS	12	72	5249.
DOD3HS	1	73	7640.
DOD3HS	2	73	7294.
DOD3HS	3	73	5992.
DOD3HS	4	73	4727.
DOD3HS	5	73	6075.
DOD3HS	6	73	14045.
DOD3HS	7	73	11543.
DOD3HS	8	73	7649.
DOD3HS	9	73	10462.
DOD3HS	10	73	8031.
DOD3HS	11	73	7066.
DOD3HS	12	73	5340.
DOD3HS	1	74	9874.
DOD3HS	2	74	7945.
DOD3HS	3	74	7600.
DOD3HS	4	74	6287.
DOD3HS	5	74	8695.
DOD3HS	6	74	17038.
DOD3HS	7	74	13966.
DOD3HS	8	74	12974.
DOD3HS	9	74	13037.
DOD3HS	10	74	10174.
DOD3HS	11	74	8441.
DOD3HS	12	74	5370.
DOD3HS	1	75	10407.
DOD3HS	2	75	8171.
DOD3HS	3	75	7296.
DOD3HS	4	75	7192.
DOD3HS	5	75	9377.
DOD3HS	6	75	21053.
DOD3HS	7	75	14550.
DOD3HS	8	75	14697.
DOD3HS	9	75	8969.
DOD3HS	10	75	11614.
DOD3HS	11	75	9742.
DOD3HS	12	75	8169.
DOD3HS	1	76	9597.

This variable is the GRC maximum estimate of DOD mental category 3 male volunteers who are high school graduates. The estimate was derived as the sum of male category 3 high school graduates in each service.

N3HS Navy Category 3 Volunteers who are High School Graduates

N3HS	70	7	1969.0000
N3HS	70	8	1521.0000
N3HS	70	9	983.0000
N3HS	70	10	990.0000
N3HS	70	11	997.0000
N3HS	70	12	970.0000
N3HS	71	1	1383.0000
N3HS	71	2	1202.0000
N3HS	71	3	1086.0000
N3HS	71	4	593.0000
N3HS	71	5	551.0000
N3HS	71	6	1971.0000
N3HS	71	7	2519.0000
N3HS	71	8	2012.0000
N3HS	71	9	2513.0000
N3HS	71	10	1982.0000
N3HS	71	11	1525.0000
N3HS	71	12	1106.0000
N3HS	72	1	2117.0000
N3HS	72	2	1574.0000
N3HS	72	3	1483.0000
N3HS	72	4	1009.0000
N3HS	72	5	1193.0000
N3HS	72	6	2056.0000
N3HS	72	7	2913.0000
N3HS	72	8	2241.0000
N3HS	72	9	2294.0000
N3HS	72	10	1931.0000
N3HS	72	11	1303.0000
N3HS	72	12	1095.0000
N3HS	73	1	1300.0000
N3HS	73	2	1147.0000
N3HS	73	3	1485.0000
N3HS	73	4	1252.0000
N3HS	73	5	1354.0000
N3HS	73	6	2563.0000
N3HS	73	7	3157.0000
N3HS	73	8	2262.0000
N3HS	73	9	3043.0000
N3HS	73	10	1385.0000
N3HS	73	11	1686.0000
N3HS	73	12	1234.0000
N3HS	74	1	2483.0000
N3HS	74	2	1729.0000
N3HS	74	3	1784.0000
N3HS	74	4	1552.0000
N3HS	74	5	1503.0000
N3HS	74	6	2952.0000
N3HS	74	7	3359.0000
N3HS	74	8	3361.0000
N3HS	74	9	2713.0000
N3HS	74	10	2782.0000
N3HS	74	11	2086.0000
N3HS	74	12	1534.0000
N3HS	75	1	2381.0000
N3HS	75	2	1909.0000
N3HS	75	3	1933.0000
N3HS	75	4	2121.0000
N3HS	75	5	2312.0000
N3HS	75	6	3094.0000
N3HS	75	7	3923.0000
N3HS	75	8	3385.0000
N3HS	75	9	2436.0000
N3HS	75	10	2328.0000
N3HS	75	11	2520.0000
N3HS	75	12	1962.0000
N3HS	75	1	2363.0000

This variable represents the number of Category 3 male high school graduate volunteers in the Navy from 1970-June 1975. The series was computer as the difference between GRC estimates of total Navy high school graduates of Mental Category 1, 2, 3 and Navy Category 1-2 high school graduate volunteers.

YPOP Male Population 17-21 Years of Age

YPOP	70	7	7589.2000
YPOP	70	8	7571.9000
YPOP	70	9	7504.6500
YPOP	70	10	7537.5000
YPOP	70	11	7573.7500
YPOP	70	12	8011.0500
YPOP	71	1	8046.3000
YPOP	71	2	8082.4500
YPOP	71	3	8118.7500
YPOP	71	4	8155.0000
YPOP	71	5	8191.2500
YPOP	71	6	8227.5000
YPOP	71	7	8263.8000
YPOP	71	8	8293.3500
YPOP	71	9	8336.2500
YPOP	71	10	8372.5000
YPOP	71	11	8408.9000
YPOP	71	12	8447.1000
YPOP	72	1	8484.5000
YPOP	72	2	8521.9000
YPOP	72	3	8559.1000
YPOP	72	4	8595.5000
YPOP	72	5	8633.9000
YPOP	72	6	8671.1000
YPOP	72	7	8708.5000
YPOP	72	8	8745.9000
YPOP	72	9	8783.1000
YPOP	72	10	8821.5000
YPOP	72	11	8858.9000
YPOP	72	12	8895.9500
YPOP	73	1	8873.7500
YPOP	73	2	8891.5500
YPOP	73	3	8909.3000
YPOP	73	4	8927.0000
YPOP	73	5	8944.8000
YPOP	73	6	8962.4500
YPOP	73	7	8980.2500
YPOP	73	8	8994.0500
YPOP	73	9	9015.7000
YPOP	73	10	9033.5000
YPOP	73	11	9067.9500
YPOP	73	12	9102.2500
YPOP	74	1	9135.8000
YPOP	74	2	9171.2500
YPOP	74	3	9205.5500
YPOP	74	4	9240.0000
YPOP	74	5	9274.4500
YPOP	74	6	9309.7500
YPOP	74	7	9343.8000
YPOP	74	8	9377.7500
YPOP	74	9	9412.0500
YPOP	74	10	9446.3000
YPOP	74	11	9484.0000
YPOP	74	12	9481.5000
YPOP	75	1	9493.0000
YPOP	75	2	9510.5000
YPOP	75	3	9534.0000
YPOP	75	4	9551.5000
YPOP	75	5	9568.0000
YPOP	75	6	9586.5000
YPOP	75	7	9604.0000
YPOP	75	8	9621.5000
YPOP	75	9	9639.0000
YPOP	75	10	9656.5000
YPOP	75	11	9674.0000
YPOP	75	12	9691.5000
YPOP	75	1	9709.0000

¥POP represents the male civilian population 17-21 years of age in the United States. The variable is an estimate derived at GRC by taking one-half of the 16-17 year old male civilian population (the YPOP1 variable) and combining this result with Census estimates of the 18-19 and 20-21 year old male civilian populations.

APPENDIX B

POPULATION TRENDS AND PROJECTIONS OF THE 17-21 YEAR OLD MALES

1. Size and Growth

On July 1, 1975, the 17-21 year old male population (including Armed Forces overseas) of the United States was about 10.5 million and had increased by 1.98 percent during the preceding year (in contrast to the average annual increase of 2.25 percent during 1970-75). The growth rate of this population will continuously decline to zero by sometime during 1978 when the population will reach the peak at 10.8 million. The peak year 1978 reflects the historically highest annual average number of births during 1957-1961.

Figure 1 shows the current population estimates for 17-21 year olds from Census. Projections through 1991 can be made with high confidence since births have occurred for these cohorts. However from 1991 forward, birth rate assumptions have to be made. The three lines from 1991 forward reflect current Census assumptions of 2.7 (Series I), 2.1 (Series II) and 1.7 (Series III). Current birth rates are 1.8, thus Series II, III estimates appear to be somewhat more realistic than Series I. Tables 1-4 show actual annual projections, annual percentage changes and rates of future population to 1976 for the 17-21 year old group for the three census series projections.

Beginning in 1979, the population of the 17-21 year old males will start to decline and reach the lowest projected levels at 8.7 million in 1992 in Series I, 8.4 million in 1993 in Series II, and 7.9 million in 1995 in Series III. These three lowest levels reflect 1973-1974 births

which are the lowest since 1945. After 1992-1995, the population will start to increase (reflecting the higher projected annual births beginning in 1974-75) and by 2000 it will reach 12.1 million (at an average annual increase of 4.24 percent during 1992-2000) in Series I, and 8.75 million (average annual increase of 1.02 percent during 1995-2000) in Series III.

The percent change of the population from 1975 to 2000 in each series will be: 15.6 percent in Series I, -2.3 percent in Series II, and -16.6 percent in Series III.

2. Annual Births

During 1973-74, there were just over 3.1 million births. This is the lowest annual figure since 1945 and is well below the 4.3 million annual births recorded during 1957-61. The two projection series (Series I and II) presented in Table 5 show that the annual number of births could again exceed the 4 million mark in the next 5 years. In all three projections series, the number of annual births will unlikely drop below the 1973-75 level during the next 25 years (Table 5).

Except for an initial drop in Series III, the projected annual births (determined by the projected age-specific fertility rates and the projected female population in the childbearing ages) will increase until the mid-1980's in all three projection series. As the result, the 17-21 year old population will start to increase from the low level in 1992-1995. The female population in prime childbearing ages (18 to 34) has increased rapidly from 19.6 million in 1960 to the projected 33.9 million in 1985, due to the entry of the baby boom into these age cohorts. Because of this increase in the childbearing population; Series I and Series II (in which

Figure B.1

Percent Change in Annual Estimates and Projections of
17 - 21 Year Old Male Population from 1976

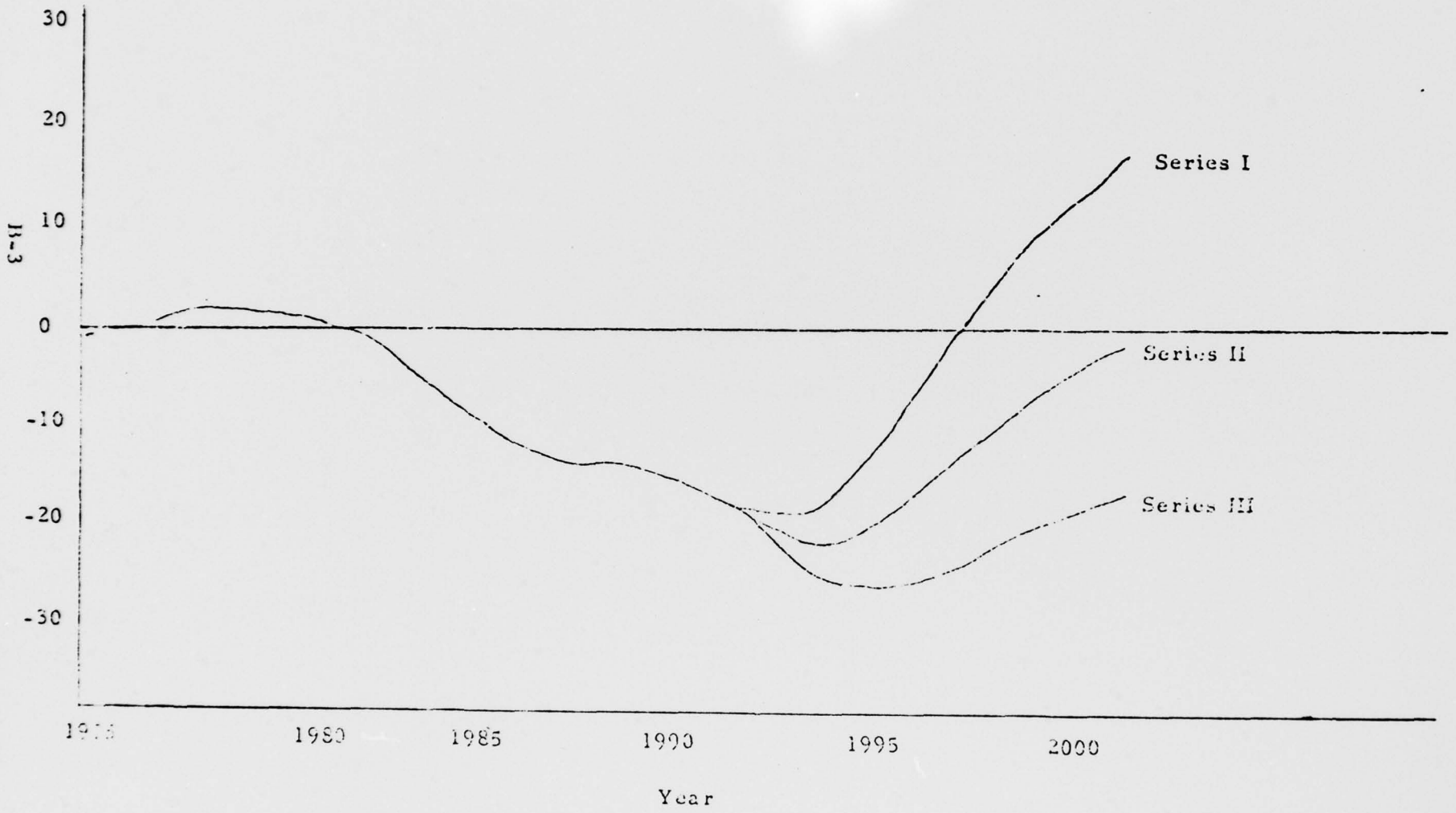


TABLE B.1

Annual Projections [1] of the 17-21 Years Old

Male Population [2]

Year (July 1)	17-21 Years Old Total (000)	Annual Percentage Change	Ratio: Pop. in Year / Pop. in 1976
1976	10618		
1977	10707	+.84	1.008
1978	10808	+.94	1.018
1979	10791	-.16	1.016
1980	10740	-.47	1.011
1981	10669	-.66	1.005
1982	10511	-1.48	.990
1983	10215	-2.82	.962
1984	9909	-3.00	.933
1985	9593	-3.19	.903
1986	9328	-2.76	.879
1987	9199	-1.38	.866
1988	9217	+.20	.868
1989	9145	-.78	.861
1990	9005	-1.5	.848
1991	8808	-2.19	.830

---

[1] Current Population Reports: Population Estimates and Projections, Series P-25, No. 601: Projections of the Population of the United States: 1975 to 2050, Bureau of the Census, October, 1975.

[2] Includes Armed Forces overseas.

TABLE B.2

Series I [1] 17-21 Year Old Population [2]

Projections [3]

	17-21 Population (000)	Annual Percentage Change	Ratio: Pop. in Year / Pop. in 1976
1992	8706	-1.16	820
1993	8716	+.11	.821
1994	9001	+3.27	.848
1995	9507	+5.62	.895
1996	10143	+6.69	.955
1997	10731	+5.80	1.011
1998	11248	+4.82	1.059
1999	11715	+4.15	1.103
2000	12135	+3.59	1.143
2001	12506	+3.06	1.178

1/ Fertility Rate of 2.7 assumed

2/ Includes Armed Forces overseas

3/ Current Population Reports: Population Estimates and projections Series P-25 No. 601: Projections of the Population of the United States: 1975 to 2050. Bureau of the Census, October, 1975.

TABLE B.3

Series II [1] 17-21 Year Old Population [2]

Projections [3]

	17-21 Population (000)	Annual Percentage Change	Ratio: Pop. in Year / Pop. in 1976
1992	8605	-2.30	.810
1993	8417	-2.18	.793
1994	8444	+.32	.795
1995	8656	+2.51	.815
1996	8971	+3.64	.845
1997	9317	+3.86	.877
1998	9669	+3.78	.911
1999	9985	+3.27	.940
2000	10253	+2.68	.966
2001	10469	+2.11	.986

1/ Fertility Rate of 2.1 assumed

2/ Includes Armed Forces overseas

3/ (Same as on previous Table)

TABLE B.4

Series III [1] 17-21 Year Old Population [2]

Projections [3]

	17-21 Population (000)	Annual Percentage Change	Ratio: Pop. in Year / Pop. in 1976
1992	8537	-3.08	.804
1993	8176	-4.23	.770
1994	7970	-2.52	.751
1995	7935	-.44	.747
1996	7999	+.81	.753
1997	8140	+1.76	.767
1998	8357	+2.66	.787
1999	8583	+2.63	.808
2000	8753	+1.98	.824
2001	8861	+1.23	.835

1/ Fertility Rate of 1.7 assumed

2/ Including Armed Forces overseas

3/ (Same as on previous Table)

Table B.5

Estimates and Projections of the Average Annual Number of Births: Selected Years 1940-2000 (In Thousands)

Estimates

Year (July 1-June 30)	Total	Black	Non Black	Year (July 1-June 30)	Total	Black	Non Black
1940-45	2903			1964-65	3940	613	3327
1945-50	3555			1965-66	3716	591	3125
1950-55	3949			1966-67	3608	564	3044
1955-56	4167			1967-68	3520	553	2967
1956-57	4312			1968-69	3567	539	3028
1957-58	4313			1969-70	3652	559	3093
1958-59	4298			1970-71	3713	582	3131
1959-60	4279			1971-72	3393	546	2847
1960-61	4350	632	3718	1972-72	3195	525	2670
1961-62	4259	627	3632	1973-74	3115	509	2606
1962-63	4158	624	3561	1974-74	3187	521	2666
1963-64	4119	624	3495				

Projections

Year (July 1-June 30)	Series I			Series II			Series III		
	Total	Black	Non Black	Total	Black	Non Black	Total	Black	Non Black
1975-76	3679	592	3078	3285	541	2744	2946	497	2449
1976-77	3932	617	3315	3425	554	2871	2958	495	2463
1977-78	4156	634	3522	3575	567	3008	3092	501	2591
1978-79	4356	649	3707	3720	578	3142	3223	506	2717
1979-80	4539	663	3876	3865	586	3279	3323	509	2814
1980-81	4703	676	4027	3978	592	3386	3375	511	2864
1981-82	4853	686	4167	4049	596	3453	3406	511	2895
1982-83	4982	695	4287	4104	598	3506	3428	510	2918
1983-84	5087	702	4385	4414	599	3545	3437	508	2929
1984-85	5166	707	4459	4167	598	3569	3435	504	2931
1985-90	5243	715	4528	4146	589	3557	3376	490	2886
1990-95	5093	715	4378	3949	565	3384	3173	457	2716
1995-2000	5076	737	4339	3783	552	3231	2944	428	2516

Source of Data: U. S. Bureau of the Census, Current Population Reports, Series P-25, No. 614 (for 1970-1975) and No. 601 (for other years).

the total fertility rates projected to be higher than the current rate) show substantial increases in the projected numbers of annual births. Even in Series III (in which the projected fertility rate is below the current rate) the projected annual births will exceed the current level by 1979-80.

In Series I, the annual births will increase rapidly from the 1973-74 figure of 3.1 million, exceeding 4 million by 1977-78 and reaching the 5 million mark by 1983-84. In Series II, the annual births will increase steadily from the 1973-74 figure to 4 million in 1981-82 and will drop slightly below 4 million in 1981-82 and will drop slightly below 4 million during the 1990's. In Series III, the annual births will drop slightly below 3 million in 1975-77 and then increase to 3.4 million during 1981-85 before beginning a long-term decline reflecting below-replacement level fertility.

It is easy to see that the annual births (Table 5) closely reflect the movement of the 17-21 year old male population (Tables 1-4 and Figure 1). Shown in Table 6 is the estimates and projections of total fertility rates from 1940 to 2000.

3. Annual Fertility

The fertility rate (number of live births per 1000 women) has declined since 1960 (Table 6). The post-1970 decline is accounted for almost entirely be a decline of fertility within marriage. Although it is not certain, the decline may be attributed to both a postponment of fertility

Table B.6

Estimates and Projections of Total Lifetime Fertility Rates: Selected Years: 1940-2000
(Rates Represent Live Births per 1,000 Women)

Year (Calendar Year)	Total	White	Black	Total	White	Black	Total	White	Black
Estimates									
1940				2232	2178	2627			
1945				2424	2376	2744			
1950				3031	2946	3595			
1955				3502	3407	4140			
1960				3608	3513	4254			
1965				2885	2767	3631			
1970				2434	2340	2957			
1971				2249	2145	2812			
1972				1997	1896	2528			
1973				1869	1767	2835			
Projections		Series I			Series II			Series III	
1974	1854	1750	2375	1814	1717	2327	1797	1700	2275
1975	1984	1900	2475	1823	1717	2310	1696	1600	2175
1976	2089	2000	2550	1847	1750	2300	1631	1500	2075
1977	2172	2100	2555	1887	1800	2295	1635	1550	2047
1978	2243	2175	2560	1929	1850	2290	1674	1600	2019
1979	2304	2250	2564	2972	1900	2280	1706	1650	1991
1980	2360	2312	2567	2010	1958	2264	1719	1666	1963
1985	2586	2579	2571	2081	2049	2169	1713	1676	1828
1990	2693	2709	2569	2110	2100	2079	1708	1690	1710
1995	2714	2737	2569	2113	2119	2010	1706	1707	1624
2000	2708	2723	2618	2107	2113	2021	1703	1707	1619

Source of Data: U. S. Bureau of the Census, Current Population Reports, Series P-25, No. 601.

and a decline in lifetime fertility among the young women in the child-bearing ages.

The possible role of economic conditions in the post-1970 decline has been suggested among many factors such as the changing roles of women, postponment of marriage, increasing use of reliable contraceptives, and concern for overpopulation. The seasonally adjusted unemployment rate of all civilian workers increased from 3.4 percent in the first quarter of 1969 to 8.9 percent in the second quarter of 1975, and median income in constant dollars has remained approximately the same in the same period. If indeed economic conditions are tied to fertility rate and the present economic conditions prevail, there is a real possibility that annual fertility in the near future could drop below or remain around the current low level regardless of the projected rates in Table 6.

In Series I, the projected fertility rate increases from 1854 in 1974 to the ultimate assumption of 2700. In Series II, from 1814 to the ultimate 2100. In Series III from 1797 to the ultimate 1700.

4. Race Composition

On July 1, 1975, the black population of the 17-21 year old males was 12.7% of the total 17-21 male population, up from 11.9% in 1970. The increase is due to the faster annual growth rate of the black in this group (3.5% for the black and 2.1% for the non-black annually during

Table B.7

Percent Distributions of Estimates and Projections of the 17-21 Year Old Black Male Population: Selected Years, 1970-2000

Year	Percent	Year	Percent
1970	11.9	1995:	
		Series I	15.1
1975	12.7	Series II	15.4
		Series III	15.6
1980	13.4	2000:	
		Series I	13.8
1985	14.2	Series II	14.2
		Series III	14.4
1990	14.9		

1970-75). The percent of the population of the 17-21 year old males who are black will increase up to above 15% until 1993-94 and will start to decline when the growth rate of the black would be slower than that of the non-black. By 2000, the percent of the black will be settled around 14% (Table 7). This projected trend is also implied by the projected annual births (Table 5) and the projected annual total fertility rates (Table 6). The higher growth rate (or slower decline rate) of the black up to 1979-1994 is due to the black's younger age structure (favorable to a higher birth rate) and higher fertility rates. However, each of the three projection series eventually assumes an ultimate, complete cohort fertility rate which is identical for both black and non-black women starting with the 1970 birth cohorts (i.e. the women born in 1970).

As shown in Table 8, between 1975 and 2000 the 17-21 year old black male population is projected to increase from 1.33 million to 1.67 million (25.6% increase) in Series I, increase to 1.46 million (9.8% increase) in Series II, and decrease to 1.26 million (5.3% decrease) in Series III. The non-black male population of the same age group during the same period is projected to increase from 9.17 million to 10.47 million (14.2% increase) in Series I, decrease to 8.79 million (4.1% decrease) in Series II, and decrease to 7.49 million (18.3% decrease) in Series III.

Table B.8

Annual Projections of the 17-21 Year Old Population by Race

Year (July 1)	17-21 Years Old		
	Total	Black	Non Black
1976	10618	1366	9252
1977	10707	1391	9316
1978	10808	1414	9394
1979	10791	1427	9364
1980	10740	1437	9303
1981	10669	1442	9227
1982	10511	1441	9070
1983	10215	1422	8793
1984	9909	1395	8514
1985	9593	1364	8229
1986	9328	1340	7988
1987	9199	1326	7873
1988	9217	1338	7879
1989	9145	1343	7802
1990	9005	1339	7666
1991	8808	1325	7483

Year (July 1)	Series I			Series II			Series III		
	Total	Black	Non Black	Total	Black	Non Black	Total	Black	Non Black
1992	8706	1331	7375	8605	1317	7288	8537	1305	7232
1993	8716	1340	7376	8417	1301	7116	8176	1265	6911
1994	9001	1379	7622	8444	1307	7137	7970	1243	6727
1995	9507	1437	8070	8656	1335	7321	7935	1237	6698
1996	10143	1507	8636	8971	1368	7603	7999	1237	6762
1997	10731	1561	9170	9317	1397	7920	8140	1239	6901
1998	11248	1602	9646	9669	1423	8246	8357	1247	7110
1999	11715	1638	10077	19985	1444	8541	8583	1256	7327
2000	12135	1670	10465	10253	1460	8793	8753	1261	7492
2001	12506	1700	10806	10469	1472	8997	8861	1264	7615

5. Basic Assumptions in the Projection Series

The cohort-component method of projecting population requires the three major assumptions on future fertility, mortality, and net immigration. The fertility assumption is divided into three parts--cohort fertility rates, timing patterns of fertility, and period fertility rates.

5a. Cohort Fertility Rates

The ultimate levels of completed cohort fertility (average number of lifetime births per woman) are as follows: Series I - 2.7, Series II - 2.1, and Series III - 1.7.

The Series II assumes an ultimate cohort fertility rate at the replacement level of 2.1 and cohort fertility around replacement level commencing with women presently in the young childbearing ages. The replacement level of 2.1 is suggested by two considerations. The first consideration is that population growth must cease at some point in the future, probably at a replacement level. The second consideration is based on the survey data collected annually from 1971 to 1974 on total births expected by young wives whose completed fertility will be around replacement level. In the survey, the average number of lifetime births expected by wives 18 to 24 years old was 2.4 in 1971, 2.3 in 1972 and 1973, and 2.2 in 1974. When adjusted for unmarried women, the fertility rate of all women 18-24 years old will be lower. The Series I assumption (2.7) and the Series III assumption (1.7) reflect an attempt to provide a one-child range around the Series II (2.1).

It was also assumed that the ultimate cohort fertility rates for white and black women will be identical in each projection series. For white women, the ultimate cohort fertility rate for each projection series will start with the 1965 birth cohort. For black women, the ultimate cohort rates will be reached with the 1965 birth cohort for Series I, and with 1970 birth cohort for Series II and III. The survey data on expected births show that the average numbers of total births expected by young white and black wives are identical. Because of higher incidence of unwanted births among black women, the ultimate cohort rates for the black in Series II and III will commence with the 1970 birth cohort (in contrast to the white with the 1965 birth cohort in all three series).

5b. Timing Patterns of Fertility

One ultimate timing pattern of fertility (i.e, proportionate distribution of fertility by age of women) is used for all three series: a mean age of 26.0 and a median age of 25.6 for childbearing. It was assumed that the ultimate timing of fertility will be reached starting with the 1970 birth cohort for white women and with the 1980 cohort for black women.

5c. Period Fertility Rates

The computation of projected births for each future year requires projections of birth rates for each age (or birth cohort) in the childbearing ages (14 to 49). The first step in obtaining the necessary age-specific birth rates is projections of cohort fertility rates by age by interpolating

linearly between estimated age-specific birth rates of 1973 and ultimate age-specific birth rates. The projected birth rates by age are then adjusted on calendar year basis to make sure that the implied trends in projections of annual total fertility rates are reasonable (see Table o for "period fertility rates").

5d. Mortality

One set of mortality projections which assume a slight reduction in future mortality is used for all projection series. The use of only one set of mortality projections reflects the relatively small changes that have occurred in mortality rate. Death rates for the childbearing ages are sufficiently low and further reduction would have little effect on the size and age structure of the future population.

The mortality projections used by the Census were made by the Office of the Actuary of the Social Security Administration. Based on provisional mortality data for 1972 for white, black, and other races and on final mortality data for 1969 for black and other races separately, a set of survival rates by age, sex, and race was prepared for 1972, which is the base date of the mortality projections. These rates were computed for 1972 based on the 1970 Census population.

While current mortality rates are higher for blacks than whites, it is assumed that the ultimate mortality rates by race will be identical.

5e. Net Immigration

All projection series assume a net immigration of 400,000 per year. This figure is close to the current annual level of alien immigration into the United States during the past 10 years.

The assumed distribution of annual net immigration by age, sex, and race is based on recent trends. The assumed distribution of net immigration of 17-21 year old males by age and race is shown below.

Age	Race		
	All Races	Black	Non-Black
17	3,800	500	3,300
18	3,800	500	3,300
19	3,900	600	3,300
20	3,900	400	3,500
21	3,800	400	3,400
Total	19,200	2,400	16,800