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ABSTRACT

The impact of decreasing enrollments is being felt by many postsecondary institutions. Some institutions have been forced to close as a result of their failure to recognize the problem and their consequent entrapment in a vicious spiral: decreasing enrollments bring about reduced revenues; declining income results in personnel and program cutbacks; economy measures cause the institution to be less attractive to students, which in turn results in additional enrollment reductions. Effective methods of enrollment analysis and planning must be developed if an institution is to avoid entrapment in the downward spiral. A case study of Johnson County Community College's computerized planning model describes a method of projecting realistic future enrollments. Output from the demographic model consists of population projections of males and females by age group for each geographic area in the county; a county forecast for all areas may have as many as 200,000 individual projections. The demographic planning model is described in detail, and alternative uses in community planning are noted. Selected applications of the system are suggested in the text. A hypothetical county is created, and a complete demographic analysis of future population and enrollment trends is provided as a means of demonstrating the system. (AH)

# A COMPUTER MODEL FOR DEMOGRAPHIC PROJECTIONS IN EDUCATIONAL PLANNING

Presented November 19, 1974

by

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Conference on Population Projections and Related Futures

The Department of Educational Planning
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Toronto, Ontario

## PREFACE

This report summarizes the authors' presentations to the Conference on Population Projections and Related Futures. Dr. Elaine L. Tatham is Director of Institutional Research, Johnson County Community College. Dr. Harold L. Finch is Vice President of the College and also serves as Director of the Institute for Community/College Development.

In addition to this report, we will be happy to share information about other educational and community planning activities of the Institute. Conference participants should direct inquiries to Dr. Finch.

Robert G. Harris

Robert G. Harris
President
Johnson County Community College

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## I. THE POSTSECONDARY NEED FOR DEMOGRAPHIC PLANNING

As the products of the postwar baby boom reached their late teens in the 1960's, it was inevitable that college enrollments would increase at unprecedented rates. Likewise, the baby bust which followed the boom was destined to have an equally dramatic--but opposite--affect in the 1970's and early 1980's. The impact is already being felt. In the past three years, 50 private institutions have been closed due to insufficient enrollments. Public institutions have also paid the price--a midwestern university was forced to release over 100 instructors; a state college cut its staff by 7 percent last year and another 15 percent this year; and a college in Nebraska ceased operation less than ten years after its inception. To one degree or another, almost all colleges have been affected by the shrinking market of "college age" students.

But these are only the early warning signs of an approaching storm. For those institutions that are unprepared and do not begin to prepare, the worst is yet to come. For the prepared, the next five years will present unprecedented challenges--opportunities for self-renewal and revitalization that will put them in good stead to survive the 70's and to resume vigorous growth in numbers and efficiency in the 80's and on into the twenty-first century.

Some important lessons can be learned from those institutions that have failed to survive the dilemma of declining enrollments. In examining a number of closures, there seems to be a common pattern of events and circumstances during the waning years and months of survival:

- *Failure to Recognize the Problem.* Enrollment forecasts are consistently high. Projections tend to perpetuate the heyday trends of the last decade and do not properly take into account key demographic factors. Missed forecasts are explained away as one-time flukes. A typical "explanation" of this fall's enrollment drop was given by the dean of a state college who cited the following causes: "...elimination of the draft, opportunity to earn good money in jobs which do not require a college education, general economic down turn, increased tendency of students to leave school periodically, and...increase in non-resident tuition over the last few years." Having diagnosed the problem incorrectly, staffing and budgeting plans for next year then tend to be projected on the basis that enrollments and revenues will be "back to normal."

• *Too Little Too Late*. The seriousness of the problem is recognized too late. The dynamics of closure is very much like that of quicksand--once an institution is entrapped, efforts for survival tend to only accelerate the rate at which it succumbs. A vicious spiral develops: decreasing enrollments bring about reduced revenues; declining income results in cutbacks in programs, staff recruitment, and promotion; economy measures cause the institution to be less attractive to students, which in turn results in additional enrollment reductions.

From this pattern it might be concluded that if an institution is to remain healthy during the 1970's it is essential that effective methods of enrollment analysis and planning be developed--and that this be accomplished and operational <u>before</u> the institution becomes entrapped in the downward spiral.

The most important considerations in enrollment analysis and planning in this time of declining numbers of "college age" students are recognition of the problem and timely response. The traditional recruitment program has been designed for 18 to 22 year-olds. For many colleges, the answer has simply been to recruit harder and more aggressively from this same pool of students. Since the number of students in this age group is limited, this results in the zero sum game. The winners may increase their enrollments but for every winning college there will be one or more losing colleges. However, not all colleges are restricting their strategies to this competitive approach--many are experimenting with methods that are unique, some of which appear to have considerable promise.

## II. A CASE STUDY IN DEMOGRAPHIC ANALYSIS AND PLANNING

The postsecondary enrollment dilemma and a positive approach to dealing with the problem can be illustrated by exam: ; the situation at Johnson County Community College. Through its Institute for Community/College Development, this Kansas college is making a concerted effort to generate realistic enrollment forecasts and to formulate practical long-range planning strategies. The enrollment trends, the causes and the associated problems and solutions for Johnson County are different only in degree from those of any other part of the country. Therefore, the approach described herein and the results reported may be useful to other colleges which also need plans of action--not reaction--in order to remain, or to become, dynamic, thriving institutions at a time when many are struggling for mere existence.

During the last decade the number of "college age" students in Johnson County, like the rest of the country, rose at an unprecedented rate. However, in the late 1960's a downward trend began to develop and is currently intensifying. Birth rates are the single most important contributing factor to this decline. Analysis indicates that the genesis of the problem was not low fertility rates in the 50's and 60's, but rather the low birth rates which followed the depression and preceeded World War II. This phenomenon, which is not atypical to the rest of the United States, Canada and Europe, is illustrated in Figure 1 on the following page. Although the schematic oversimplifies the complex dynamics of demography, the following conclusions apply to many colleges throughout the country:

- The current decline in number of "college age" students will intensify and reach a peak in the late 70's.
- The coming of this decline was predictable in the late 30's--some 40 years in advance.

Approach: Analytical Modeling

Johnson County Community College (JCCC) initiated the development of a long-range population planning capability in 1971. The project was jointly funded by the college and the Shawnee Mission K-12 public school district, Since over 90 percent of JCCC students reside in Johnson County, the first step was the creation of a comprehensive data base for Johnson County. It included such information as births and deaths, population distribution by age and sex, census tract boundaries, housing units, land use zoning and school attendance rates. The accomplishment of this task provided a number of insights into the population profile and past trends. As important as these data were, however, they did not by themselves provide an integrated picture of the interrelationships that exist between and among pertinent planning variables, nor did they provide a means of assessing alternatives. To counter this deficiency, the

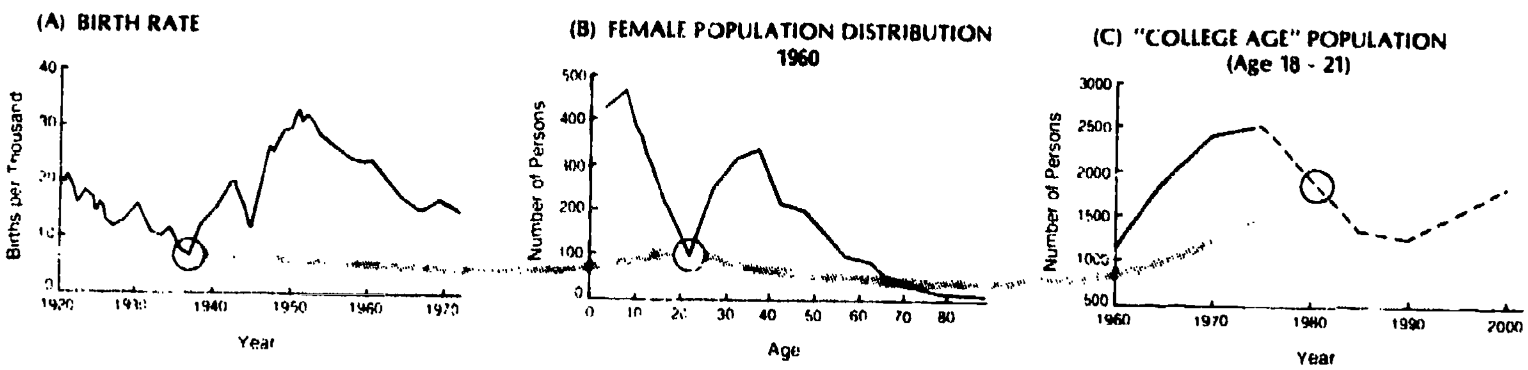



*Figure 1. Population trends of a developed subdivision of Johnson County Kansas are representative of much of the nation. (A) Birth rates reached an all-time low during the late 30's; (B) this resulted in a relatively low number of women of child bearing age in 1960; (C) which, in turn, is projected to cause the current downturn in "college age" population to be at its height by 1980.*

college's research and planning staff developed a computerized planning model designed to translate the demographic data into a form amenable to decision-making.

Output from the demographic model, which is described in Section III, consists of population projections of males and females by age group for each neighborhood or location in the county. Depending on directions specified by the user, a 30-year forecast for one geographic area within the county yields up to 6,000 individual projections. A county forecast for all areas may have as many as 200,000 individual projections. With this level of detailed output, it is possible for the JCCC planner to make detailed enrollment studies of feeder neighborhoods within the college's service area. By inspecting historical data, specific locations can be identified where certain age groups have unusually low participation rates at the college. By combining these findings with the model's population forecasts, the planner can pinpoint target areas that are not adequately served. This enables the institution to focus its efforts to bring about change to areas which have potential of yielding maximum return. Specialized follow-up studies can then be conducted to identify needs not currently being met. For example, research may show that counseling and student recruitment efforts are deficient, that there is a demand for additional offerings or that information about existing programs needs to be more effectively disseminated. As a result, the college can be more responsive to existing markets and can identify and create new markets for future expansion.

Another of the model's useful features is its ability to provide for parametric analysis. Many parameters pertinent to enrollment analysis and planning are affected by socioeconomic and political conditions that cannot be known in advance. For example, fertility rate is a function of such factors as international relations, the state of the economy, abortion legislation and world-wide food shortages. Because the user can only speculate as to future fertility rates and because of the importance of this factor in demographic planning, the model makes it possible to analyze a range or series of possible values of this variable. Likewise there is provision for the systematic analysis of the population impact of all other significant parameters. These parameters are referred to in Section III as "what if" variables.

## III. THE JCCC DEMOGRAPHIC PLANNING MODEL

The demographic planning tool is referred to as a model because its primary function is to simulate, or to model. In making a series of projections, it begins by analytically profiling the county's quarter million residents. Each person's demographic characteristics--sex, age, place of residence--are recorded in the computer memory. The predicted lives of these persons are then simulated for the coming year. In each neighborhood and age group, some will die. Deaths are analytically simulated using actuarial rates as the basis for forecasting. Others are allowed to give birth, taking into account prevalent fertility rates as they apply to the age of each of the potential mothers of Johnson County. Other residents will move out of the county and some will move to other neighborhoods within the county. Some will move into Johnson County neighborhoods from outside the county. These actions are simulated by employing current trends in migration propensity factors for each age group and neighborhood. Some areas within the county are allowed to grow to accommodate utilization of undeveloped land. Tracts which are zoned for park or industrial development are not allowed to accept in-migration.

### Simulation Process

The model uses an enhancement of cohort analysis. A "cohort" is defined as a group of people with a common characteristic. For example, women born in

1950 who live in Johnson County would be a cohort. People can leave this group only through death or through out-migration from Johnson County. For those born outside Johnson County in 1950, they can enter this group only through in-migration to Johnson County. This particular cohort of people can be traced throughout their entire life if death rates and net migration by age and sex are known.

The analytical simulation process is fundamentally straight forward.

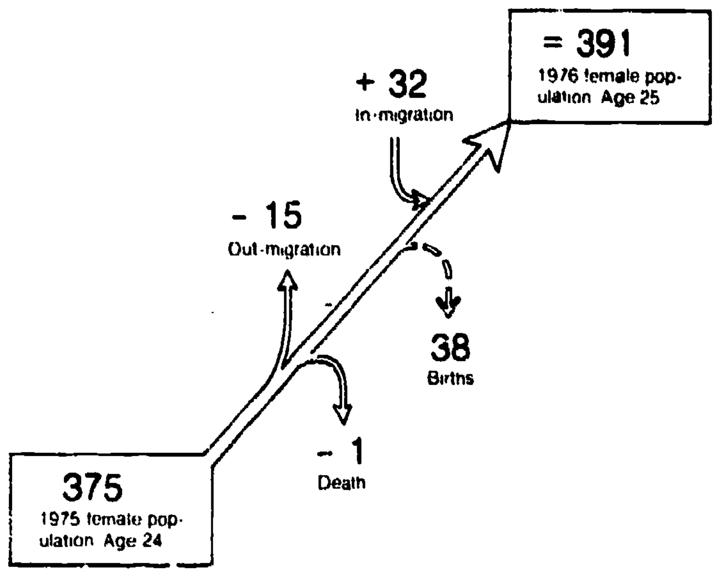



*Figure 2. Sample calculation. Birth, death and migration data are obtained via empirically derived algorithms.*

Referring to Figure 2 above, assume that 375 women, 24 years of age in 1974, currently live in a specified neighborhood in Johnson County. Also assume that it is known that the following events will take place in the coming year: 15 will move out of the neighborhood, 32 will move in, 1 will die, and 38 will give birth. By simple arithmetic it can be predicted that one year later, the number of women, now 25 years of age, living in the neighborhood will be 391. The portion of the analysis that is not straight forward--the method of estimating the number of births, deaths and migrations--is accomplished through the generation and use of empirically derived mathematical algorithms.

The simulation process is continued one year at a time by allowing each age group to become one year older. The procedure is continued for as many years as the user specifies. College enrollment forecasts are completed by introducing college participation factors. These factors make it possible to convert numbers of people to numbers of students.

"What If" Variables

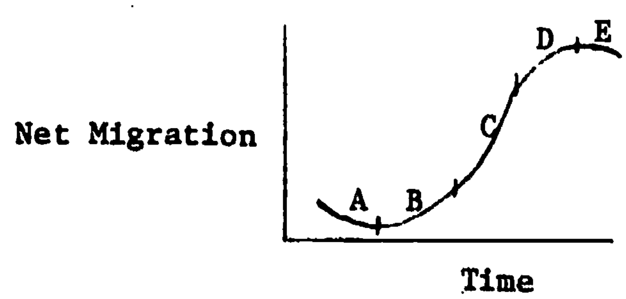
To enable the user to conduct parametric analysis, four major input variables are incorporated into the model. Since the user may assign alternative values to these variables, they are referred to as "what if" variables. These four variables are death rate, birth rate, net migration and land use.

*Death Rates.* Deaths are projected separately for males and females as a function of the number of people for each age. The user has two "what if" options. Using the term "nominal" rates to refer to the death rate equations of the model, the percentage of the "nominal" rate to be used in generating the forecast is specified for the beginning year and ending year of the projections. While the initial year multiplier would be 100 percent if the death equations are current, the initial year multiplier permits the use of an equation developed within the last few years. The ending year multiplier allows the user to examine the effect of declining or increasing death rates on the growth of the population.

*Birth Rates.* Three options are available for projecting birth rates. The option typically used is the equation which projects the number of births using the fertility rates by age of women. The second option uses the crude birth rate. The third option uses a polynomial equation which can be modified by the user to provide various forecast relationships.

In addition to selecting one of the three birth rate equations, the user has two additional "what if" options. Using the term "nominal" rate to refer to the birth rates of the selected equation, the percentage of the "nominal" rate to be used in generating the forecast is specified for the beginning year and ending year of the projections. While the initial year multiplier would be 100 percent if the selected equation is current, the initial year multiplier is a means to use an equation developed within the last few years. The ending year multiplier permits the user to examine the effect of a declining or increasing birth rate upon the population projections. The multipliers for the intervening years are found by fitting a straight line through the two points determined by the initial year and multiplier together with the ending year and multiplier.

*Net Migration*. The user specifies the county net migration (number of people moving into minus number of people moving out) for the beginning year and ending year. Given the "what if" county net migration for a specified year, each geographic subdivision of the county (referred to as a subarea) receives a percentage of the county yearly net migration. Subareas are assigned a negative percentage if the net migrations can be expected to be negative. Total subarea net migration is assigned by age and sex. This age and sex distribution is accomplished by combining subareas of Johnson County into five groups on the basis of net migration for the preceding ten years. With net migration plotted as a function of time these five groups represent five stages in the development of land and are designated "A" through "E" on the typical population S-curve below.



These five stages may be described as follows:

A. Agricultural - undeveloped in terms of potential population capacity. During this stage there is a net out-migration typical of most rural areas today.

B. Initial transition from rural to urban/suburban accompanied by a shift from out-migration to in-migration.

C. Maximum rate of development. During this stage in-migration greatly exceeds out-migration.

D. Reduced rate of growth. As the area approaches maturity the rate of net in-migration begins to decline.

E. Maximum development. The available land is essentially fully utilized. During this stage, there is a gradual shift from in-migration to out-migration.

*Land Use*. Land use designations are based on zoning. Categories employed by the model are special, agriculture, industrial, commercial, low density residential, medium density residential, high density residential and unzoned. The zoning is specified for the beginning year. The user has the option of incorporating anticipated zoning changes into the model. This information can be obtained from city or county zoning boards, regional councils, title insurance companies, etc. Each subarea is divided into smaller subunits. Depending upon the population density of the subarea, these smaller subunits are sections (approximately one square mile), ¼ sections (approximately ¼ square mile) or ¼¼ sections (approximately 1/16 square mile). For each of these subunits, zoning is specified. The portion of the subunit which lies within the boundaries of the subarea is recorded as a fraction. The capacity (maximum number of people who could ultimately reside in the subunit on the basis of current zoning) is calculated and incorporated into the population projections.

Modified Cohort Analysis

The model has two major differences from the typical cohort survival model. Cohort analysis for a population living within a fixed geographic area does not directly consider the population affects of zoning or non-constant rates of migration. For example, suppose a subarea of the county has a 1970 population of 20,000. The typical cohort analysis might project a population of 30,000 in 1980 and a population of 60,000 in 2000. However, if the land is primarily zoned for low density residential, a maximum realistic population might be 50,000. The basic problem is related to estimates of net migration. To alleviate the problem and prevent a geographic area from exceeding its capacity, a two-point logistic curve (see Appendix A) is used to develop subarea net migration percentages for the ending year. The logistic curve is also used to distribute the population of each subarea to smaller geographic units such as sections.

In summary, the model can be described in general terms as being a modified cohort survival model. Regression analysis is used to develop equations for birth rates and death rates. The two-point logistic curve is used to develop net migration subarea percentages and for distributing the population of each subarea to smaller units such as sections.

Output

A computer printout mock-up is shown on page 31. For each identified subarea, the user specifies the year increment for printout. For example, data can be printed for each year, every three years, every five years, or in general every _n_ years where _n_ is an integer. If the starting year is 1973 and _n_ is four, printouts will be for 1977, 1981, etc. The user also specifies the age increment for printout. If the selected increment is five, the printout will give the forecast for ages 0-4, 5-9, 10-14, etc.

For each year of printout, the population is presented using the following age code. When the printout is by five-year age groups, the "age 5" denotes children less than five years old, while "age 10" denotes children five through nine, and "15" denotes children age ten through fourteen. When the printout is by one-year ages, the "age 1" denotes births, while "age 2" denotes children age one, "age 3" denotes children age two, etc. The printed ages are, therefore, used as upper limits to the actual age interval. Corresponding migration and death output are applicable to the preceding year.

In addition, for each year of printout, population is presented by ¼¼ section (or other subunit) for the following age groups:

- Under five
- Five through eight
- Nine through eleven
- Twelve through fourteen
- Fifteen through seventeen
- Eighteen and nineteen
- Twenty through twenty-four
- Twenty-five through forty
- Forty-one through fifty-nine
- Sixty and over

The population for these ¼¼ sections (sixteen ¼¼ sections = one section) should be considered in aggregation with surrounding ¼¼ sections. This aggregation is especially important in areas which currently are sparsely populated or where zoning changes seem likely. These ¼¼ section populations should be used individually only as guides showing future population trends.

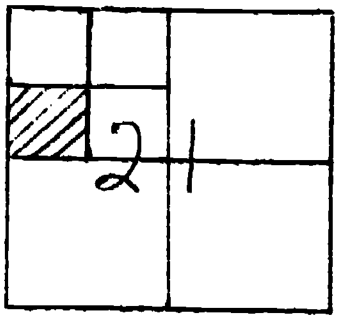
The approximate 1960 and 1973 populations are shown for each ¼¼ section along with their capacities. The relationships of the 1973 population to the capacity is presented as a decimal "FC" (1973 population/capacity). Projections by ¼¼ section continue to present the relationships of projected population to capacity as a decimal under the heading "Pop./Cap."

The ¼¼ sections are coded as follows:

- The first and second digits refer to the township
- The third and fourth digits refer to the range
- The fifth and sixth digits refer to the section
- The seventh digit is the ¼ section (beginning in the upper right hand quadrant with the number 1 and moving counter clockwise to the upper left hand quadrant denoted 2, the lower left quadrant denoted 3 and lower right quadrant denoted 4)

- The eighth digit is the ¼¼ section (designated by the same procedure used for ¼ sections).

For example, the digits 12252123 designate township 12, range 25, section 21, upper left hand quadrant, lower left ¼¼ section. This ¼¼ section is shaded in the sample section 21 below.




The mock-up sample on page 31 has a 0 as the eighth digit since the level of detail is only ¼ section. The program as applied to Johnson County analyzed three major sets of assumptions. They are summarized below:

- Low Growth Assumption. For net migration of 1200 per year, the printout is by five-year age increments for males and females for 1978, 1984, 1988, 1993 and 1998. The fertility rates by age of women were permitted to decline so that by the year 2001 they will be 80 percent of the 1973 fertility rates.

- Nominal Growth Assumption. For net migration of 3000 per year, the printout is by one-year age increments for males and females for 1974-1984. Fertility rates by age of women were assumed to continue at the current rates.

- High Growth Assumption. For net migration of 5000 per year, the printout is by five-year age increments for males and females for 1978, 1984, 1988, 1993 and 1998. Fertility rates were assumed to gradually increase to the 1970 fertility rates.

Hypothetical Illustration

Assume a fictitious county called Pirate County had a 1970 population of 300,000. The age and sex distribution is known for 1970. Equations have been developed for estimating births, deaths and net migration. The number of two year old males in 1971 is obtained by adding the number of one year old males in 1971 to the estimated net number of one year old males who moved into the county during 1971 and subtracting the estimated number of one year old male deaths for 1971. The procedure is similar for all ages and each year (see also page 7). The sample printouts on pages 23 through 30 in Appendix B illustrate the impact of some alternative user assumptions for population growth in Pirate County. The table on page 21 summarizes the results. Pages 32 and 33 illustrate the use of population projections by age group and sub-area in developing enrollment projections for a fictitious community college located in Pirate County. Although the county population can be expected to grow, it is anticipated that college freshmen enrollment will decline and remain at or below 1973 numbers through 1985. It should also be noted that in this illustration the number of freshmen, ages 15-19, continues to decline through 1985 while the number of freshmen for the other three age groups continues to increase after 1975.

## IV. COMMUNITY PLANNING ASSISTANCE

JCCC has used the demographic model extensively. Enrollment projections (see Appendix C, p. 35) are central to the long-range personnel, program, budget and facility planning process. Room utilization forecasts with respect to the existing campus are illustrated on page 36.

Use of the demographic planning model has not been restricted to college enrollment studies because any organization that serves people can benefit from demographic planning. In Johnson County, over 100 organizations and agency representatives have received assistance from Johnson County Community College in analyzing existing markets or service areas as well as projecting into the future. They have included government agencies, city planners, park departments, fire departments, hospitals, chambers of commerce, churches, girl scouts, banks as well as public school districts.

The type and amount of assistance provided by the college depends on the needs of the requesting organization. In some cases, existing projections may suffice. In these instances, the requested data is made available at no charge. Frequently, an organization requires special stud' which necessitate additional computer runs and/or analyses to relate population forecasts to the user's market. In these cases, a charge is assessed with the rate depending on the purpose of the study and whether or not the organization is profit making.

The model has been used by four of the county's six school districts. One school district incorporated the data from the demographic model into their bond campaign for additional classroom space. The voters approved the bond issue. Another school district has used the data to promise there will not be a bond issue for at least five years. This same district has also used the data for recommending boundary changes for attendance centers.

A rural fire district found that the population projections by section (one square mile) were useful as an aid in selecting a new site for a fire station. Other agencies such as hospitals and churches have also utilized the available data. Page 37 of Appendix C graphically portrays the projected membership by age group for 1975-2000 for a county church. Although the membership can be expected to grow, the growth will not be uniform for all age groups. Other graphs in Appendix C provide additional illustrations of the types of information that have been developed for community agencies.

The demographic planning capability has enabled Johnson County Community College to become involved with many elements of the community not previously reached by more traditional programs. It has also thrust the college into an active role as a community change agent. Public acceptance and encouragement of this role is indicated in an editorial comment:

> "Like prime growth centers anywhere, Johnson County and many of the municipalities within it are faced with the challenge

of how to expand in population and economy without sacrificing those services that make a community responsive to individual growth and human need. Now is the time to plan these additional services, and the JCCC demographic study can be the vital touchstone of such concern."

A question frequently asked is "How can a college afford to develop a demographic capability?" Last year one of the nations largest community college districts passed a multi-campus bond issue. Because good population and enrollment forecasts have not been available, the construction program remains at a standstill. In the meantime, inflation is eroding the bonds at a rate exceeding $25,000 per day. As this example illustrates, the question should be rephrased to ask "How can a college afford <u>not</u> to develop a demographic planning capability?"

APPENDIX A

MISCELLANEOUS THEORY

# TWO-POINT LOGISTIC CURVE

S - shaped 

$$P_{t_1+\theta} = \frac{K}{1+e^{a+b\theta}}$$

Where P is population

$t_1$ is starting year

$\theta$ is number of years past starting year

K is holding capacity

Given K and $P_{t_1}$ for year $t_1$

$P_{t_2}$ for year $t_2$, where $t_2 > t_1$

$$a = \ln\left(\frac{K-P_{t_1}}{P_{t_1}}\right) \qquad b = \left[\frac{\ln\left(\frac{K-P_{t_2}}{P_{t_2}}\right) - a}{t_2-t_1}\right]$$

<u>Example</u>

$K = 1{,}500{,}000$

$t_1 = 1960$ , $P_{1960} = 180{,}000$

$t_2 = 1970$ , $P_{1970} = P_{1960+10} = 300{,}000$

$$a = \ln\left(\frac{1{,}500{,}000-180{,}000}{180{,}000}\right) = \ln\left(\frac{1{,}320{,}000}{180{,}000}\right) = \ln\left(\frac{132}{18}\right)$$

$$= \ln\left(\frac{22}{3}\right) = \ln(22) - \ln(3) = 3.09104 - 1.09861 = 1.99243$$

$$b = \frac{\ln\left(\frac{1{,}500{,}000-300{,}000}{300{,}000}\right) - 1.99243}{1970-1960} = \frac{\ln\left(\frac{1{,}200{,}000}{300{,}000}\right) - 1.99243}{10}$$

$$= \frac{\ln(4) - 1.99243}{10} = \frac{1.38629-1.99243}{10} = \frac{-.60614}{10} = -.060614$$

So $$P_{1960+\theta} = \frac{1{,}500{,}000}{1+e^{1.99243-.060614\theta}}$$

APPENDIX B

SAMPLE RESULTS SUMMARIZED

## ILLUSTRATION

Pirate County is a fictitious county with a population of 300,000 in 1970. The county can be characterized as a growing community with a positive net migration and with the number of births approximately three times the number of deaths. The table below summarizes the population projections for the year 1985 and the year 2000 under each of eight user alternative assumptions. The graph on the following page characterizes net migration by age group and sex. Pages 23 through 30 present the sample assumptions together with the corresponding projections for 1985 and 2000. Page 31 shows a sample printout which includes printout by section. The last two pages of this appendix illustrate the use of population projections by age group and subarea in developing enrollment projections.

PIRATE COUNTY POPULATION PROJECTIONS
1970 Population was 300,000

| User Alternative Assumptions | 1985 Population | 2000 Population |
|---|---|---|
| Zero Net Migration | 363,616 | 414,249 |
| Low Birth Rate and Net Migration | 376,851 | 433,345 |
| Low Net Migration | 381,678 | 454,718 |
| Low Birth Rate | 412,561 | 511,139 |
| Nominal | 417,800 | 535,655 |
| High Birth Rate | 423,040 | 560,399 |
| High Net Migration | 453,924 | 616,594 |
| High Birth Rate and Net Migration | 459,576 | 644,495 |

# PIRATE COUNTY

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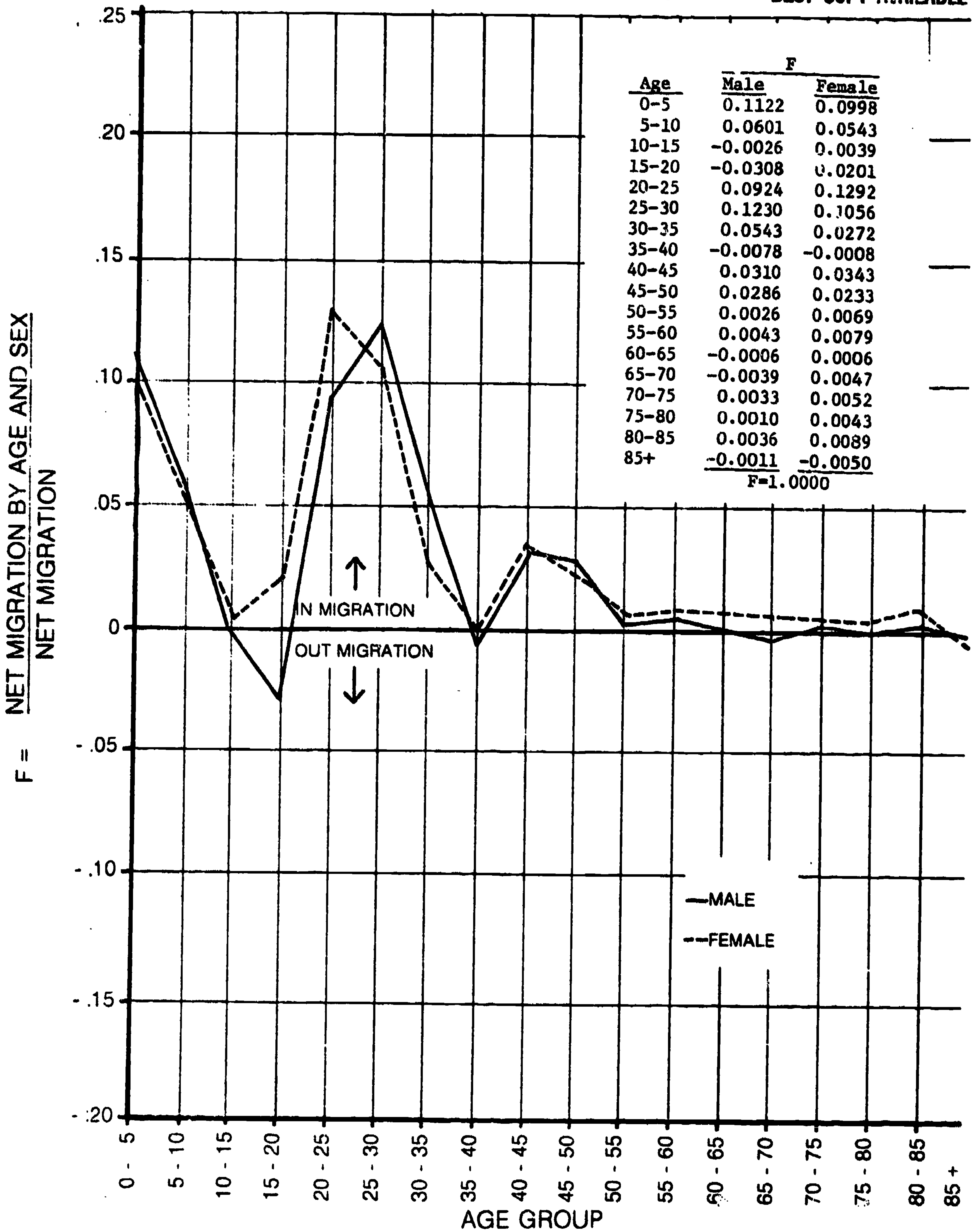


| Age | F Male | F Female |
|---|---|---|
| 0-5 | 0.1122 | 0.0998 |
| 5-10 | 0.0601 | 0.0543 |
| 10-15 | -0.0026 | 0.0039 |
| 15-20 | -0.0308 | 0.0201 |
| 20-25 | 0.0924 | 0.1292 |
| 25-30 | 0.1230 | 0.1056 |
| 30-35 | 0.0543 | 0.0272 |
| 35-40 | -0.0078 | -0.0008 |
| 40-45 | 0.0310 | 0.0343 |
| 45-50 | 0.0286 | 0.0233 |
| 50-55 | 0.0026 | 0.0069 |
| 55-60 | 0.0043 | 0.0079 |
| 60-65 | -0.0006 | 0.0006 |
| 65-70 | -0.0039 | 0.0047 |
| 70-75 | 0.0033 | 0.0052 |
| 75-80 | 0.0010 | 0.0043 |
| 80-85 | 0.0036 | 0.0089 |
| 85+ | -0.0011 | -0.0050 |

F=1.0000

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ASSUMPTION:
ZERO NET MIGRATION

```
 10/22/74. 10.18.37.
PROGRAM   COHORT


ENTER STARTING & ENDING YEAR, PRINT DELTA YRS,& PRT. AGE INTERVALS
 ? 1970,2000,15,10
ENTER YR, %(FRACTION) TO BE APPLIED TO BIRTH RATES & TYPE
 ? 2000,1,1
ENTER YR & %(FRACTION) TO BE APPLIED TO DEATH RATES
 ? 2000,1
ENTER MIG.& START P FL.NAME,YR1,NET MIG1,YR2,NET MIG2
 ? COHRPIR,1970,.001,2000,.001
YEAR =   1985
         1985    1984    1984    1985    1984    1984
AGE     M POP   M MIG   M DEA   F POP   F MIG   F DEA
 10     33578       0      85   32032       0      59
 20     27381      -0      14   26076       0      10
 30     34348       0      23   33272       0      19
 40     21604       0      27   24103       0      25
 50     20232       0      67   22214       0      55
 60     18330       0     173   19835       0     137
 70     15256      -0     351   16197       0     287
 80      6528       0     358    7780       0     368
 90      1557       0     170    2504       0     277
100       214       0      36     489       0      93
110        22       0       4      66       0      12
  0 179049          0    1307  184567       0    1342
YEAR =   2000
         2000    1999    1999    2000    1999    1999
AGE     M POP   M MIG   M DEA   F POP   F MIG   F DEA
 10     33624       0      78   32058       0      60
 20     36020      -0      18   34389       0      18
 30     29274       0      19   27978       0      22
 40     30249       0      42   28775       0      49
 50     30174       0      87   29650       0     102
 60     17178       0     157   21103       0     211
 70     15740      -0     363   16735       0     465
 80     11439       0     628   11841       0     865
 90      3659       0     370    3385       0     529
100       514       0      76     348       0      95
110        42       0       6      24       0       7
  0 207953          0    1844  206296       0    2424
STOP.
```

ASSUMPTION:
NET MIGRATION DECREASES 67 PERCENT
BIRTH RATES DECREASE 20 PERCENT BY 2000

```
 10/22/74. 09.54.01.
PROGRAM    COHORT


ENTER STARTING & ENDING YEAR, PRINT DELTA YRS,& PRT. AGE INTERVALS
 ? 1970,2000,15,10
ENTER YR, %(FRACTION) TO BE APPLIED TO BIRTH RATES & TYPE
 ? 2000,.8,1
ENTER YR & %(FRACTION) TO BE APPLIED TO DEATH RATES
 ? 2000,1
ENTER MIG.& START P FL.NAME,YR1,NET MIG1,YR2,NET MIG2
 ? COMPIR,1970,1000,2000,1000
YEAR =   1985
```

| | 1985 | 1984 | 1984 | 1985 | 1984 | 1984 |
|---|---|---|---|---|---|---|
| AGE | M POP | M MIG | M DEA | F POP | F MIG | F DEA |
| 10 | 33715 | 172 | 82 | 32108 | 154 | 57 |
| 20 | 28802 | -33 | 15 | 27490 | 24 | 10 |
| 30 | 35091 | 215 | 24 | 34779 | 235 | 20 |
| 40 | 23829 | 47 | 30 | 26429 | 26 | 28 |
| 50 | 21215 | 60 | 70 | 23018 | 58 | 56 |
| 60 | 18843 | 7 | 178 | 20387 | 15 | 140 |
| 70 | 15376 | -5 | 353 | 16397 | 5 | 290 |
| 80 | 6526 | 4 | 358 | 7879 | 10 | 373 |
| 90 | 1583 | 3 | 173 | 2592 | 4 | 286 |
| 100 | 217 | 0 | 36 | 490 | 0 | 93 |
| 110 | 21 | 0 | 4 | 64 | 0 | 12 |
| 0 | 185219 | 470 | 1321 | 191632 | 530 | 1366 |

YEAR = 2000

| | 2000 | 1999 | 1999 | 2000 | 1999 | 1999 |
|---|---|---|---|---|---|---|
| AGE | M POP | M MIG | M DEA | F POP | F MIG | F DEA |
| 10 | 31627 | 172 | 71 | 30098 | 154 | 54 |
| 20 | 35962 | -33 | 18 | 34375 | 24 | 19 |
| 30 | 31403 | 215 | 20 | 30729 | 235 | 25 |
| 40 | 33223 | 47 | 46 | 32249 | 26 | 54 |
| 50 | 32747 | 60 | 96 | 32650 | 58 | 113 |
| 60 | 19378 | 7 | 173 | 23114 | 15 | 227 |
| 70 | 16367 | -5 | 376 | 17418 | 5 | 483 |
| 80 | 11666 | 4 | 637 | 12183 | 10 | 886 |
| 90 | 3732 | 3 | 374 | 3488 | 4 | 545 |
| 100 | 518 | 0 | 76 | 352 | 0 | 97 |
| 110 | 42 | 0 | 6 | 24 | 0 | 7 |
| 0 | 216666 | 470 | 1893 | 216679 | 530 | 2511 |

STOP.

**BEST COPY AVAILABLE**

**ASSUMPTION:**
**NET MIGRATION DECREASES 67 PERCENT**

```
 10/22/74. 09.49.23.
PROGRAM    COHORT

ENTER STARTING & ENDING YEAR, PRINT DELTA YRS,& PRT. AGE INTERVALS
 ? 1970,2000,15,10
ENTER YR, %(FRACTION) TO BE APPLIED TO BIRTH RATES & TYPE
 ? 2000,1,1
ENTER YR & %(FRACTION) TO BE APPLIED TO DEATH RATES
 ? 2000,1
ENTER MIG.& START P FI.NAME,YR1,NET MIG1,YR2,NET MIG2
 ? COHRRIR,1970,1000,2000,1000
YEAR =   1985
```

| | 1985 | 1984 | 1984 | 1985 | 1984 | 1984 |
|---|---|---|---|---|---|---|
| AGE | M POP | M MIG | M DEA | F POP | F MIG | F DEA |
| 10 | 35994 | 172 | 80 | 34280 | 154 | 62 |
| 20 | 28994 | -33 | 15 | 27673 | 24 | 10 |
| 30 | 35091 | 215 | 24 | 34779 | 235 | 20 |
| 40 | 23829 | 47 | 30 | 24429 | 26 | 28 |
| 50 | 21215 | 60 | 70 | 23018 | 59 | 56 |
| 60 | 18843 | 7 | 178 | 20357 | 15 | 140 |
| 70 | 15376 | -5 | 353 | 16397 | 5 | 290 |
| 80 | 6526 | 4 | 358 | 7879 | 10 | 373 |
| 90 | 1583 | 3 | 173 | 2592 | 4 | 286 |
| 100 | 217 | 0 | 36 | 490 | 0 | 93 |
| 110 | 21 | 0 | 4 | 64 | 0 | 12 |
| 0 | 187690 | 470 | 1328 | 193288 | 530 | 1372 |

```
YEAR =   2000
```

| | 2000 | 1999 | 1999 | 2000 | 1999 | 1999 |
|---|---|---|---|---|---|---|
| AGE | M POP | M MIG | M DEA | F POP | F MIG | F DEA |
| 10 | 37920 | 172 | 88 | 36197 | 154 | 67 |
| 20 | 39657 | -33 | 19 | 37902 | 24 | 20 |
| 30 | 32354 | 215 | 21 | 31637 | 235 | 25 |
| 40 | 33223 | 47 | 46 | 32249 | 26 | 54 |
| 50 | 32747 | 60 | 96 | 32650 | 58 | 113 |
| 60 | 19378 | 7 | 173 | 22114 | 15 | 227 |
| 70 | 16367 | -5 | 376 | 17418 | 5 | 483 |
| 80 | 11666 | 4 | 637 | 12183 | 10 | 886 |
| 90 | 3732 | 3 | 374 | 2488 | 4 | 545 |
| 100 | 518 | 0 | 76 | 352 | 0 | 97 |
| 110 | 42 | 0 | 6 | 24 | 0 | 7 |
| 0 | 227604 | 470 | 1912 | 227114 | 530 | 2526 |

```
STOP.
```

ASSUMPTION:
BIRTH RATES DECREASE 20 PERCENT BY 2000

```
 10/29/74. 09.35.23.
PROGRAM    CØHORT

ENTER STARTING & ENDING YEAR, PRINT DELTA YRS.& PRT. AGE INTERVALS
 ? 1970,2000,15,10
ENTER YR, %(FRACTIØN) TO BE APPLIED TØ BIRTH RATES & TYPE
 ? 2000,.8,1
ENTER YR & %(FRACTIØN) TO BE APPLIED TO DEATH RATES
 ? 2000,1
ENTER MIG.& START P FL.NAME,YR1,NET MIG1,YR2,NET MIG2
 ? CØHRPIR,1970,3000,2000,3000
YEAR =   1985
```

| | 1985 | 1984 | 1984 | 1985 | 1984 | 1984 |
|---|---|---|---|---|---|---|
| AGE | M POP | M MIG | M DEA | F POP | F MIG | F DEA |
| 10 | 38344 | 517 | 91 | 36410 | 462 | 63 |
| 20 | 32020 | -100 | 16 | 30676 | 72 | 11 |
| 30 | 36576 | 646 | 25 | 37794 | 704 | 21 |
| 40 | 28280 | 140 | 35 | 31079 | 79 | 32 |
| 50 | 23181 | 179 | 75 | 24626 | 173 | 59 |
| 60 | 19969 | 21 | 186 | 21490 | 44 | 147 |
| 70 | 15617 | -14 | 357 | 16798 | 16 | 296 |
| 80 | 6522 | 13 | 357 | 8077 | 29 | 383 |
| 90 | 1637 | 8 | 180 | 2768 | 12 | 306 |
| 100 | 222 | 0 | 37 | 493 | 0 | 93 |
| 110 | 21 | 0 | 4 | 61 | 0 | 11 |
| 0 | 292289 | 1409 | 1362 | 210272 | 1591 | 1424 |

```
YEAR =   2000
```

| | 2000 | 1999 | 1999 | 2000 | 1999 | 1999 |
|---|---|---|---|---|---|---|
| AGE | M POP | M MIG | M DEA | F POP | F MIG | F DEA |
| 10 | 39075 | 517 | 87 | 37086 | 462 | 66 |
| 20 | 42838 | -100 | 21 | 41021 | 72 | 22 |
| 30 | 37496 | 646 | 24 | 37982 | 704 | 30 |
| 40 | 39171 | 140 | 53 | 39196 | 79 | 64 |
| 50 | 37893 | 179 | 113 | 38632 | 173 | 135 |
| 60 | 23777 | 21 | 205 | 27134 | 44 | 259 |
| 70 | 17620 | -14 | 402 | 18783 | 16 | 520 |
| 80 | 12120 | 13 | 657 | 12866 | 29 | 930 |
| 90 | 3798 | 8 | 381 | 3696 | 12 | 579 |
| 100 | 527 | 0 | 78 | 360 | 0 | 99 |
| 110 | 44 | 0 | 7 | 25 | 0 | 8 |
| 0 | 254359 | 1409 | 2026 | 256780 | 1591 | 2713 |

```
STOP.
```

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**ASSUMPTION:**
**NOMINAL ASSUMPTIONS**

```
10/22/74. 09.27.47.
PRØGRAM   CØHØRT


ENTER STARTING & ENDING YEAR, PRINT DELTA YRS.& PRT. AGE INTERVALS
 ? 1970,2000,15,10
ENTER YR, %(FRACTION) TØ BE APPLIED TØ BIRTH RATES & TYPE
 ? 2000,1,1
ENTER YR & %(FRACTION) TØ BE APPLIED TØ DEATH RATES
 ? 2000,1
ENTER MIG.& START P FL.NAME,YR1,NET MIG1,YR2,NET MIG2
 ? COHPPIR,1970,3000,2000,3000
YEAR =   1985
```

| | 1985 | 1984 | 1984 | 1985 | 1984 | 1984 |
|---|---|---|---|---|---|---|
| AGE | M PØP | M MIG | M DEA | F PØP | F MIG | F DEA |
| 10 | 40826 | 517 | 98 | 38777 | 462 | 69 |
| 20 | 32219 | -100 | 16 | 30867 | 72 | 11 |
| 30 | 36576 | 646 | 25 | 37794 | 704 | 21 |
| 40 | 28280 | 140 | 35 | 31079 | 79 | 32 |
| 50 | 23181 | 179 | 75 | 24626 | 173 | 59 |
| 60 | 19869 | 21 | 186 | 21490 | 44 | 147 |
| 70 | 15617 | -14 | 357 | 16798 | 16 | 296 |
| 80 | 6522 | 13 | 357 | 8077 | 29 | 383 |
| 90 | 1637 | 8 | 180 | 2768 | 12 | 306 |
| 100 | 222 | 0 | 37 | 493 | 0 | 93 |
| 110 | 21 | 0 | 4 | 61 | 0 | 11 |
| 0 | 204971 | 1409 | 1370 | 212829 | 1591 | 1430 |

YEAR = 2000

| | 2000 | 1999 | 1999 | 2000 | 1999 | 1999 |
|---|---|---|---|---|---|---|
| AGE | M PØP | M MIG | M DEA | F PØP | F MIG | F DEA |
| 10 | 46511 | 517 | 107 | 44175 | 462 | 82 |
| 20 | 46932 | -100 | 23 | 44929 | 72 | 24 |
| 30 | 38514 | 646 | 25 | 38954 | 704 | 31 |
| 40 | 39171 | 140 | 53 | 39196 | 79 | 64 |
| 50 | 37893 | 179 | 113 | 38632 | 173 | 135 |
| 60 | 23777 | 21 | 205 | 27134 | 44 | 259 |
| 70 | 17620 | -14 | 402 | 18783 | 16 | 520 |
| 80 | 12120 | 13 | 657 | 12866 | 29 | 930 |
| 90 | 3798 | 8 | 381 | 3696 | 12 | 579 |
| 100 | 527 | 0 | 78 | 360 | 0 | 99 |
| 110 | 44 | 0 | 7 | 25 | 0 | 8 |
| 0 | 266906 | 1409 | 2049 | 268749 | 1591 | 2730 |

STØP.

ASSUMPTION:
BIRTH RATES INCREASE 20 PERCENT BY 2000

10/22/74. 09.58.20.
PROGRAM COHORT

ENTER STARTING & ENDING YEAR, PRINT DELTA YRS.& PRT. AGE INTERVALS
? 1970,2000,15,10
ENTER YR, %(FRACTION) TO BE APPLIED TO BIRTH RATES & TYPE
? 2000,1.2,1
ENTER YR & %(FRACTION) TO BE APPLIED TO DEATH RATES
? 2000,1
ENTER MIG.& START P FL.NAME,YR1,NET MIG1,YR2,NET MIG2
? COHRPIR,1970,3000,2000,3000
YEAR = 1985

| | 1985 | 1984 | 1984 | 1985 | 1984 | 1984 |
|---|---|---|---|---|---|---|
| AGE | M POP | M MIG | M DEA | F POP | F MIG | F DEA |
| 10 | 43308 | 517 | 106 | 41144 | 462 | 74 |
| 20 | 32419 | -100 | 16 | 31058 | 72 | 11 |
| 30 | 36576 | 646 | 25 | 37794 | 704 | 21 |
| 40 | 28280 | 140 | 35 | 31079 | 79 | 32 |
| 50 | 23181 | 179 | 75 | 24626 | 173 | 59 |
| 60 | 19869 | 21 | 186 | 21490 | 44 | 147 |
| 70 | 15617 | -14 | 357 | 16798 | 16 | 296 |
| 80 | 6522 | 13 | 357 | 8077 | 29 | 383 |
| 90 | 1637 | 8 | 180 | 2768 | 12 | 306 |
| 100 | 222 | 0 | 37 | 493 | 0 | 93 |
| 110 | 21 | 0 | 4 | 61 | 0 | 11 |
| 0 | 207653 | 1409 | 1378 | 215387 | 1591 | 1435 |

YEAR = 2000

| | 2000 | 1999 | 1999 | 2000 | 1999 | 1999 |
|---|---|---|---|---|---|---|
| AGE | M POP | M MIG | M DEA | F POP | F MIG | F DEA |
| 10 | 54064 | 517 | 127 | 51375 | 462 | 97 |
| 20 | 51025 | -100 | 25 | 48837 | 72 | 26 |
| 30 | 39531 | 646 | 25 | 39927 | 704 | 31 |
| 40 | 39171 | 140 | 53 | 39196 | 79 | 64 |
| 50 | 37893 | 179 | 113 | 38632 | 173 | 135 |
| 60 | 23777 | 21 | 205 | 27134 | 44 | 259 |
| 70 | 17620 | -14 | 402 | 18783 | 16 | 520 |
| 80 | 12120 | 13 | 657 | 12866 | 29 | 93 |
| 90 | 3798 | 8 | 381 | 3696 | 12 | 579 |
| 100 | 527 | 0 | 78 | 360 | 0 | 99 |
| 110 | 44 | 0 | 7 | 25 | 0 | 8 |
| 0 | 279570 | 1409 | 2072 | 280829 | 1591 | 2748 |

STOP.

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ASSUMPTION:
NET MIGRATION INCREASES 67 PERCENT

```
 10/22/74. 10.03.57.
PRØGRAM   CØHØRT


ENTER STARTING & ENDING YEAR, PRINT DELTA YRS,& PRT. AGE INTERVALS
 ? 1970,2000,15,10
ENTER YR, %(FRACTIØN) TØ BE APPLIED TØ BIRTH RATES & TYPE
 ? 2000,1,1
ENTER YR & %(FRACTIØN) TØ BE APPLIED TØ DEATH RATES
 ? 2000,1
ENTER MIG.& START P FL.NAME,YR1,NET MIG1,YR2,NET MIG2
 ? CØHRPIR,1970,5000,2000,5000
YEAR =   1985
```

| AGE | 1985 M PØP | 1984 M MIG | 1984 M DEA | 1985 F PØP | 1984 F MIG | 1984 F DEA |
|---|---|---|---|---|---|---|
| 10 | 45658 | 862 | 108 | 43274 | 771 | 75 |
| 20 | 35445 | -167 | 18 | 34060 | 120 | 12 |
| 30 | 38062 | 1077 | 26 | 40810 | 1174 | 23 |
| 40 | 32731 | 233 | 41 | 35729 | 132 | 37 |
| 50 | 25148 | 298 | 80 | 26234 | 288 | 63 |
| 60 | 20895 | 35 | 195 | 22593 | 74 | 154 |
| 70 | 15858 | -23 | 360 | 17198 | 27 | 302 |
| 80 | 6518 | 22 | 357 | 8275 | 48 | 393 |
| 90 | 1690 | 13 | 187 | 2944 | 20 | 325 |
| 100 | 227 | 0 | 37 | 495 | 0 | 92 |
| 110 | 20 | 0 | 3 | 59 | 0 | 11 |
| 0 | 222253 | 2348 | 1412 | 231671 | 2652 | 1488 |

YEAR =   2000

| AGE | 2000 M PØP | 1999 M MIG | 1999 M DEA | 2000 F PØP | 1999 F MIG | 1999 F DEA |
|---|---|---|---|---|---|---|
| 10 | 55103 | 862 | 126 | 52254 | 771 | 96 |
| 20 | 54206 | -167 | 26 | 51955 | 120 | 28 |
| 30 | 44673 | 1077 | 28 | 46272 | 1174 | 37 |
| 40 | 45119 | 233 | 60 | 46143 | 132 | 75 |
| 50 | 43038 | 298 | 130 | 44613 | 288 | 158 |
| 60 | 28176 | 35 | 237 | 31154 | 74 | 292 |
| 70 | 18874 | -23 | 428 | 20147 | 27 | 556 |
| 80 | 12574 | 22 | 676 | 13550 | 48 | 973 |
| 90 | 3864 | 13 | 388 | 3903 | 20 | 612 |
| 100 | 536 | 0 | 79 | 368 | 0 | 102 |
| 110 | 45 | 0 | 7 | 25 | 0 | 8 |
| 0 | 306209 | 2348 | 2186 | 310385 | 2652 | 2935 |

STØP.

ASSUMPTION:
BIRTH RATES INCREASE 20 PERCENT BY 2000
NET MIGRATION INCREASES 67 PERCENT

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```
10/22/74. 10.11.56.
PROGRAM    COHORT


ENTER STARTING & ENDING YEAR, PRINT DELTA YRS.& PRT. AGE INTERVALS
 ? 1970,2000,15,10
ENTER YR, %(FRACTION) TO BE APPLIED TO BIRTH RATES & TYPE
 ? 2000,1.2,1
ENTER YR & %(FRACTION) TO BE APPLIED TO DEATH RATES
 ? 2000,1
ENTER MIG.& START P FL.NAME,YR1,NET MIG1,YR2,NET MIG2
 ? COHRPIR,1970,5000,2000,5000
YEAR =   1985
        1985    1984    1984    1985    1984    1984
AGE    M POP   M MIG   M DEA   F POP   F MIG   F DEA
 10    48344     862     116   45835     771      81
 20    35653    -167      18   34259     120      12
 30    38062    1077      26   40810    1174      23
 40    32731     233      41   35729     132      37
 50    25148     298      80   26234     288      63
 60    20895      35     195   22593      74     154
 70    15858     -23     360   17198      27     302
 80     6518      22     357    8275      48     393
 90     1690      13     187    2944      20     325
100      227       0      37     495       0      92
110       20       0       3      59       0      11
  0   225146    2348    1421  234430    2652    1494
YEAR =   2000
        2000    1999    1999    2000    1999    1999
AGE    M POP   M MIG   M DEA   F POP   F MIG   F DEA
 10    63806     862     150   60550     771     114
 20    58697    -167      28   56243     120      30
 30    45758    1077      29   47309    1174      37
 40    45119     233      60   46143     132      75
 50    43038     298     130   44613     288     158
 60    28176      35     237   31154      74     292
 70    18874     -23     428   20147      27     556
 80    12574      22     676   13550      48     973
 90     3864      13     388    3903      20     612
100      536       0      79     368       0     102
110       45       0       7      25       0       8
  0   320489    2348    2212  324006    2652    2956
STOP.
```

# SAMPLE PRINTOUT INCORPORATING SUB-UNIT PROJECTIONS

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CAPACITY/AREA = 0. 256. 256. 0. 0. 1200. 2400. 4000.
SUB AREA = TEST STARTING YR. = 1973. TOT. POP. = 5391. DFC/DT = -.005000 FC = 0.820500
TCUR = 1973. TBASE = 1960. SUB A = -0.19610739E 01 SUB B = 0.33948969E-01
BIRTH RATE WHAT IF? (FRAC1,FRAC2) = 0.70 0.70 BIRTH RATE TYPE USED = 1 DEATH RATE WHAT IF? (FR1,FR2) = 1.00 1.00

| ID | POP60 | POP73 | CAP. | FC | DFC/DT | PF | | A | B |
|---|---|---|---|---|---|---|---|---|---|
| 12251530 | 7.0 | 5.0 | 5.0 | 0.9999990 | 0.0000000 | 0.00060 | -0.14243654E | 02 | 0.33948969E-01 |
| 12251630 | 602.0 | 746.0 | 1176.0 | 0.6343538 | 0.0094192 | 1.16980 | -0.99227750E | 00 | 0.33948969E-01 |
| 12251640 | 983.5 | 975.0 | 1223.0 | 0.7971941 | 0.0000000 | 0.00000 | -0.18101845E | 01 | 0.33948969E-01 |
| 122[illegible]110 | 2058.0 | 1937.0 | 1992.0 | 0.9723896 | 0.0000000 | 0.00000 | -0.58240337E | 01 | 0.17403603E 00 |
| 12[illegible]120 | 2058.0 | 1728.0 | 2352.0 | 0.7346939 | 0.0000000 | 0.00000 | -0.14599056E | 01 | 0.33948969E-01 |

YEAR = 1978 SUB AREA = TEST

| AGE | MALE POP. | MALE MIG. | MALE DEA. | FEM. POP. | FEM. MIG. | FEM. DEA. |
|---|---|---|---|---|---|---|
| 5 | 205.1 | 0.9 | 0.9 | 194.8 | 0.5 | 0.6 |
| 10 | 243.6 | -4.3 | 0.1 | 245.1 | -5.2 | 0.1 |
| 15 | 251.2 | -9.7 | 0.1 | 211.0 | -8.6 | 0.1 |
| 20 | 250.6 | -9.2 | 0.1 | 246.4 | -5.9 | 0.1 |
| 25 | 238.0 | 6.1 | 0.1 | 227.5 | 9.1 | 0.1 |
| 30 | 243.1 | 9.4 | 0.2 | 257.2 | 6.5 | 0.1 |
| 35 | 276.2 | 0.3 | 0.3 | 300.0 | -2.9 | 0.2 |
| 40 | 190.7 | -7.6 | 0.3 | 166.1 | -7.6 | 0.2 |
| 45 | 108.3 | -2.4 | 0.3 | 116.5 | -2.1 | 0.2 |
| 50 | 108.8 | -1.7 | 0.5 | 124.1 | -1.9 | 0.3 |
| 55 | 119.2 | -2.7 | 0.9 | 138.9 | -1.2 | 0.6 |
| 60 | 112.5 | -0.7 | 1.4 | 148.3 | -0.1 | 1.1 |
| 65 | 106.1 | -0.8 | 2.1 | 137.6 | -1.0 | 1.7 |
| 70 | 85.7 | -0.7 | 2.7 | 103.9 | -0.6 | 2.0 |
| 75 | 64.2 | -0.2 | 3.0 | 63.7 | 0.0 | 2.1 |
| 80 | 27.5 | 0.0 | 2.0 | 42.7 | -0.2 | 2.3 |
| 85 | 17.1 | 0.5 | 1.8 | 23.7 | 0.7 | 1.9 |
| 90 | 7.7 | 0.0 | 1.0 | 10.8 | -0.5 | 1.3 |
| 95 | 1.3 | 0.0 | 0.2 | 5.4 | 0.0 | 0.9 |
| 100 | 0.4 | 0.0 | 0.1 | 2.5 | 0.0 | 0.4 |
| 105 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 110 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0 | 2657.3 | -22.8 | 18.1 | 2766.1 | -20.8 | 16.3 |

| T R S1/4 | POP. | POP./CAP. | CAPACITY | 1 | 5 | 9 | 12 | 15 | 18 | 20 | 25 | 41 | 60 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12251530 | 5.21 | 1.04120 | 5.00 | 0.38 | 0.28 | 0.37 | 0.3 | 0.3 | 0.2 | 0.4 | 1.42 | 0.89 | 0.67 |
| 12251630 | 737.51 | 0.62714 | 1176.00 | 54.38 | 39.87 | 51.72 | 37.6 | 39.5 | 27.6 | 62.9 | 202.01 | 126.70 | 95.23 |
| 12251640 | 986.08 | 0.80626 | 1223.04 | 72.71 | 53.31 | 69.16 | 50.2 | 52.8 | 36.9 | 84.0 | 270.57 | 169.10 | 127.33 |
| 12252110 | 1962.31 | 0.98509 | 1992.00 | 144.69 | 106.09 | 137.62 | 99.9 | 105.1 | 73.4 | 167.2 | 536.96 | 337.97 | 253.38 |
| 12252120 | 1732.35 | 0.73654 | 2352.00 | 127.74 | 93.66 | 121.49 | 88.2 | 92.8 | 64.8 | 147.7 | 473.27 | 298.58 | 224.11 |
| 0 | 5423.46 | 0.80371 | 6748.04 | 5208.84 | | | | | | | | | |

PIRATE COUNTY COMMUNITY COLLEGE FRESHMAN
ENROLLMENT BY AGE GROUP AND SUBAREA
1970-73



| Year | Subarea | Age Group 15-19 | 20-29 | 30-49 | 50+ | Total |
|---|---|---|---|---|---|---|
| 1970 | A | 42 | 13 | 3 | 2 | 60 |
| | B | 90 | 90 | 42 | 18 | 240 |
| | C | 240 | 60 | 90 | 30 | 420 |
| | D | 60 | 90 | 150 | 60 | 360 |
| | E | 60 | 90 | 180 | 90 | 420 |
| | Total | 492 | 343 | 465 | 200 | 1500 |
| 1971 | A | 50 | 18 | 4 | 3 | 75 |
| | B | 128 | 110 | 58 | 25 | 321 |
| | C | 346 | 97 | 125 | 47 | 615 |
| | D | 81 | 113 | 188 | 84 | 466 |
| | E | 82 | 105 | 227 | 109 | 523 |
| | Total | 687 | 443 | 602 | 268 | 2000 |
| 1972 | A | 65 | 21 | 4 | 3 | 93 |
| | B | 156 | 147 | 76 | 32 | 411 |
| | C | 438 | 123 | 162 | 63 | 786 |
| | D | 102 | 161 | 226 | 106 | 595 |
| | E | 103 | 125 | 262 | 125 | 615 |
| | Total | 864 | 577 | 730 | 329 | 2500 |
| 1973 | A | 78 | 18 | 4 | 4 | 104 |
| | B | 195 | 186 | 93 | 37 | 511 |
| | C | 528 | 162 | 198 | 78 | 966 |
| | D | 114 | 204 | 264 | 129 | 711 |
| | E | 114 | 150 | 294 | 150 | 708 |
| | Total | 1029 | 720 | 853 | 398 | 3000 |

PIRATE COUNTY COMMUNITY COLLEGE FRESHMAN
PARTICIPATION BY SUBAREA AND AGE GROUP
1970-73

| Subarea | Age Group 15-19 | 20-29 | 30-49 | 50+ |
|---|---|---|---|---|
| A | .0704 | .0134 | .0020 | .0017 |
| B | .0238 | .0136 | .0048 | .0029 |
| C | .0281 | .0055 | .0043 | .0024 |
| D | .0159 | .0149 | .0134 | .0063 |
| E | .0133 | .0118 | .0128 | .0064 |

PROJECTED PIRATE COUNTY POPULATION BY AGE GROUP AND SUBAREA

| Year | Subarea | Age Group 15-19 | 20-29 | 30-49 | 50+ |
|---|---|---|---|---|---|
| 1975 | A | 927 | 1159 | 1750 | 1730 |
| | B | 6733 | 12158 | 15835 | 10764 |
| | C | 15456 | 29092 | 41309 | 30990 |
| | D | 5450 | 12254 | 14354 | 16640 |
| | E | 6493 | 10952 | 17526 | 20033 |
| | County | 35059 | 65615 | 90774 | 80157 |
| 1980 | A | 838 | 1194 | 1518 | 1829 |
| | B | 7551 | 15785 | 19680 | 13273 |
| | C | 16226 | 36625 | 54753 | 42614 |
| | D | 4651 | 14102 | 19558 | 18714 |
| | E | 5367 | 13478 | 16879 | 20804 |
| | County | 34633 | 81184 | 112388 | 97234 |
| 1985 | A | 698 | 1259 | 1283 | 1800 |
| | B | 8373 | 18059 | 25627 | 15467 |
| | C | 12554 | 38543 | 72481 | 55276 |
| | D | 3844 | 13334 | 27087 | 19710 |
| | E | 3405 | 12512 | 18703 | 19911 |
| | County | 28874 | 83707 | 145181 | 112164 |

PROJECTED PIRATE COUNTY COMMUNITY COLLEGE FRESHMAN ENROLLMENT BY AGE GROUP AND SUBAREA

| Year | Subarea | Age Group 15-19 | 20-29 | 30-49 | 50+ | Total |
|---|---|---|---|---|---|---|
| 1975 | A | 65 | 16 | 4 | 3 | 88 |
| | B | 160 | 165 | 76 | 31 | 432 |
| | C | 434 | 160 | 178 | 74 | 846 |
| | D | 87 | 183 | 192 | 105 | 567 |
| | E | 86 | 129 | 224 | 128 | 567 |
| | County | 832 | 653 | 674 | 341 | 2500 |
| 1980 | A | 59 | 16 | 3 | 3 | 81 |
| | B | 180 | 215 | 94 | 38 | 527 |
| | C | 456 | 201 | 235 | 102 | 994 |
| | D | 74 | 210 | 262 | 118 | 664 |
| | E | 71 | 159 | 216 | 133 | 579 |
| | County | 840 | 801 | 810 | 394 | 2845 |
| 1985 | A | 49 | 17 | 3 | 3 | 72 |
| | B | 199 | 246 | 123 | 45 | 613 |
| | C | 353 | 212 | 312 | 133 | 1010 |
| | D | 61 | 199 | 363 | 124 | 747 |
| | E | 45 | 148 | 239 | 127 | 559 |
| | County | 707 | 822 | 1040 | 432 | 3001 |

APPENDIX C

SELECTED APPLICATIONS

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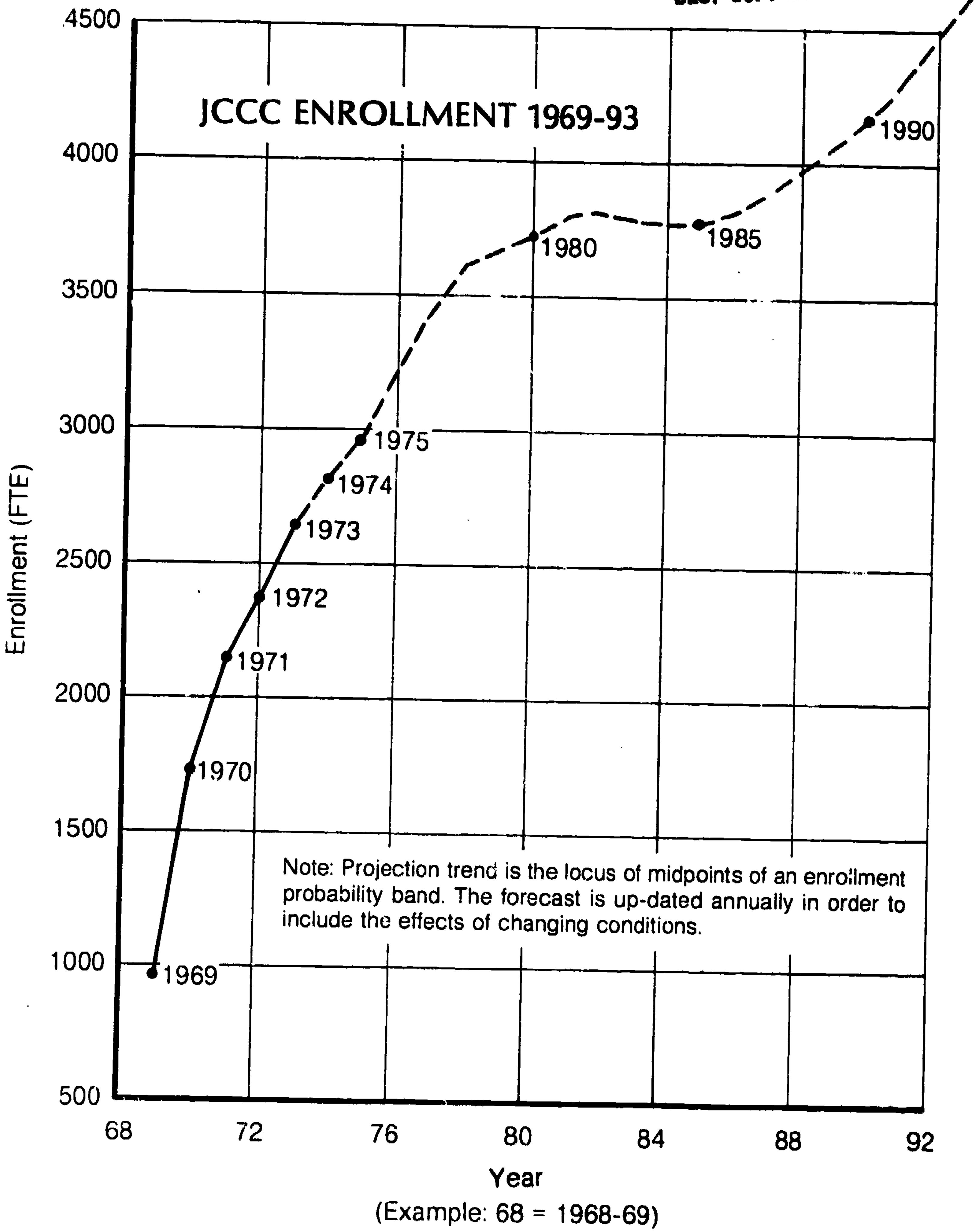

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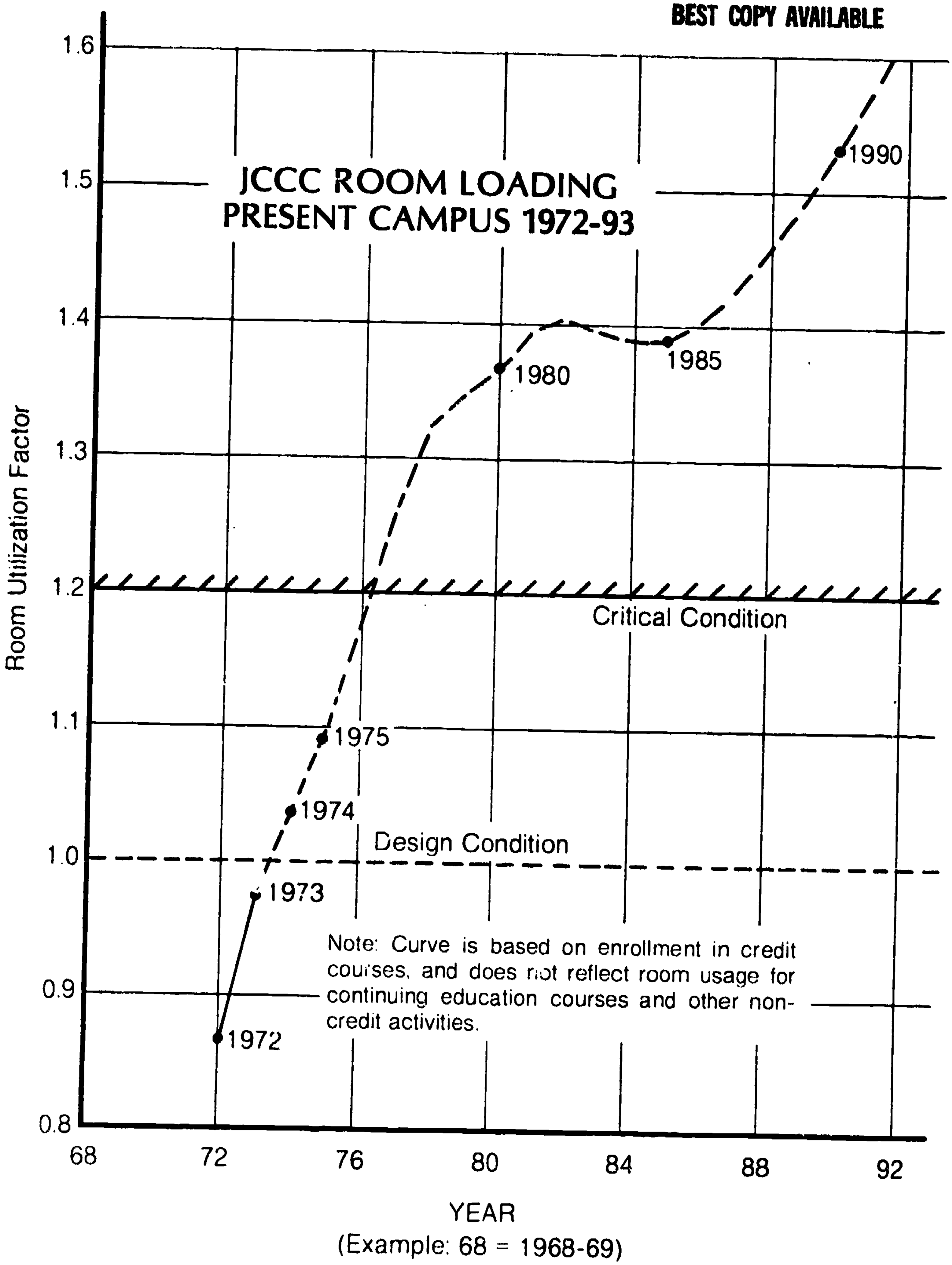

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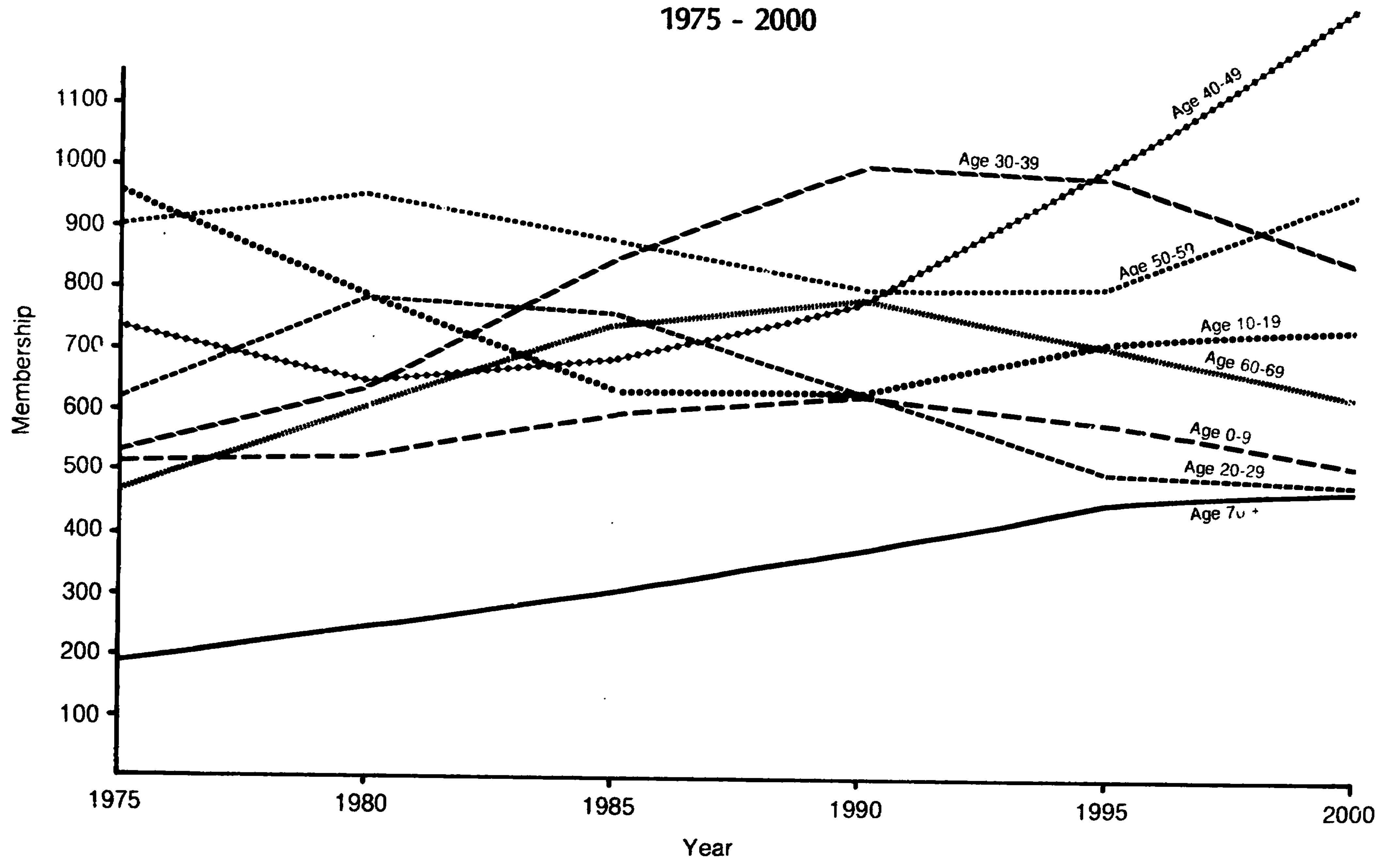
## PROJECTED SAMPLE CHURCH MEMBERSHIP FOR EIGHT AGE GROUPS 1975 - 2000



SUMMARY OF SELECTED JOHNSON COUNTY DATA

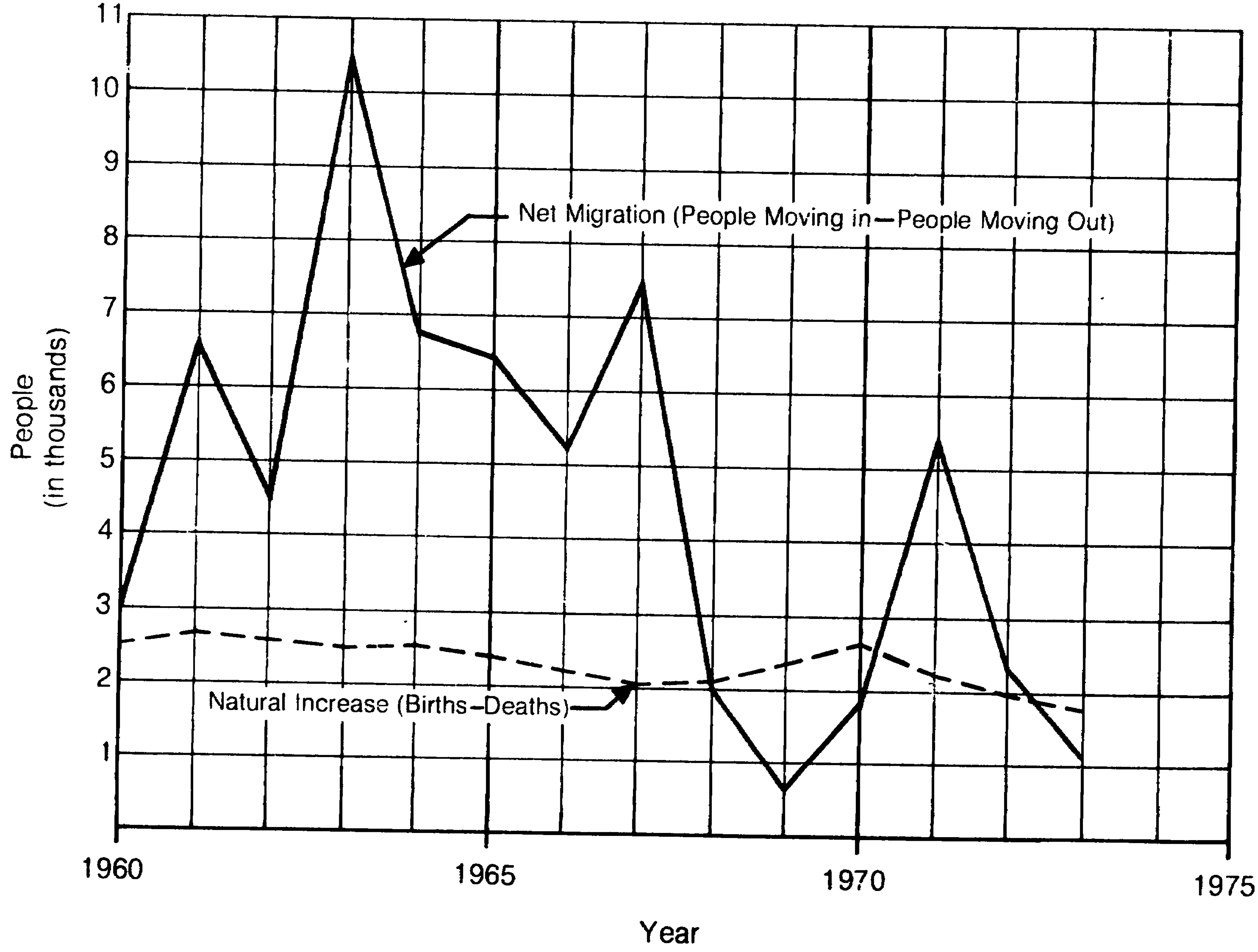
The Johnson County crude death rate (number of deaths per 1,000 population) has remained approximately five for the last ten years. As the proportion of people over 60 increases, the crude death rate can be expected to increase. However, the death rates by age and sex will probably remain similar to today's death rates by age and sex.

The Johnson County crude birth rate (number of births per 1,000 population) has been as low as 7.3 in 1938 and as high as 33 in 1951. In 1970, the crude birth rate was 16.9 and has continued to decline. However, the number of births per year compared to the number of deaths per year is almost three to one. So until the number of births equals the number of deaths, the county will continue to have natural increases in population.

For the decade 1960-70, the average net migration for each year in Johnson County was 5,000 people. The net migration per year has decreased since 1970. From 1970-73, the average net migration per year was approximately 3,000 people. The net migration for 1973 was approximately 1,200 people which was approximately one-third of the total population increase. The remaining two-thirds was due to natural increases (births minus deaths).

The following five graphs pertain to Johnson County. One graph presents county population projections through the year 2000 for each of the three current major set of assumptions cited on page 13. A second graph presents the contribution to county population increase of natural increase (births - deaths) and net migration from 1960 through 1973. The third graph presents graphically the ten year forecast for Johnson County. Those areas located in the heavily shaded areas of the map are expected to have the largest percentage population increases. The fourth graph presents the centroid of population for Johnson County from 1960 to 1990. The 1972 centroid for the JCCC student body is also shown and is almost coincident with the population centroid for that year. The center of population is moving south and west toward the communities of Olathe and Lenexa. Located near 75th and Metcalf in 1960, the population center is expected to shift to 91st and Nieman Road by 1990. The last graph shows historic and projected population by age groups from 1930 to 2000.

# COMPONENTS OF POPULATION GROWTH FOR JOHNSON COUNTY 1960 - 1973



# POPULATION
# TEN YEAR FORECAST

Percent Increase Over 1973

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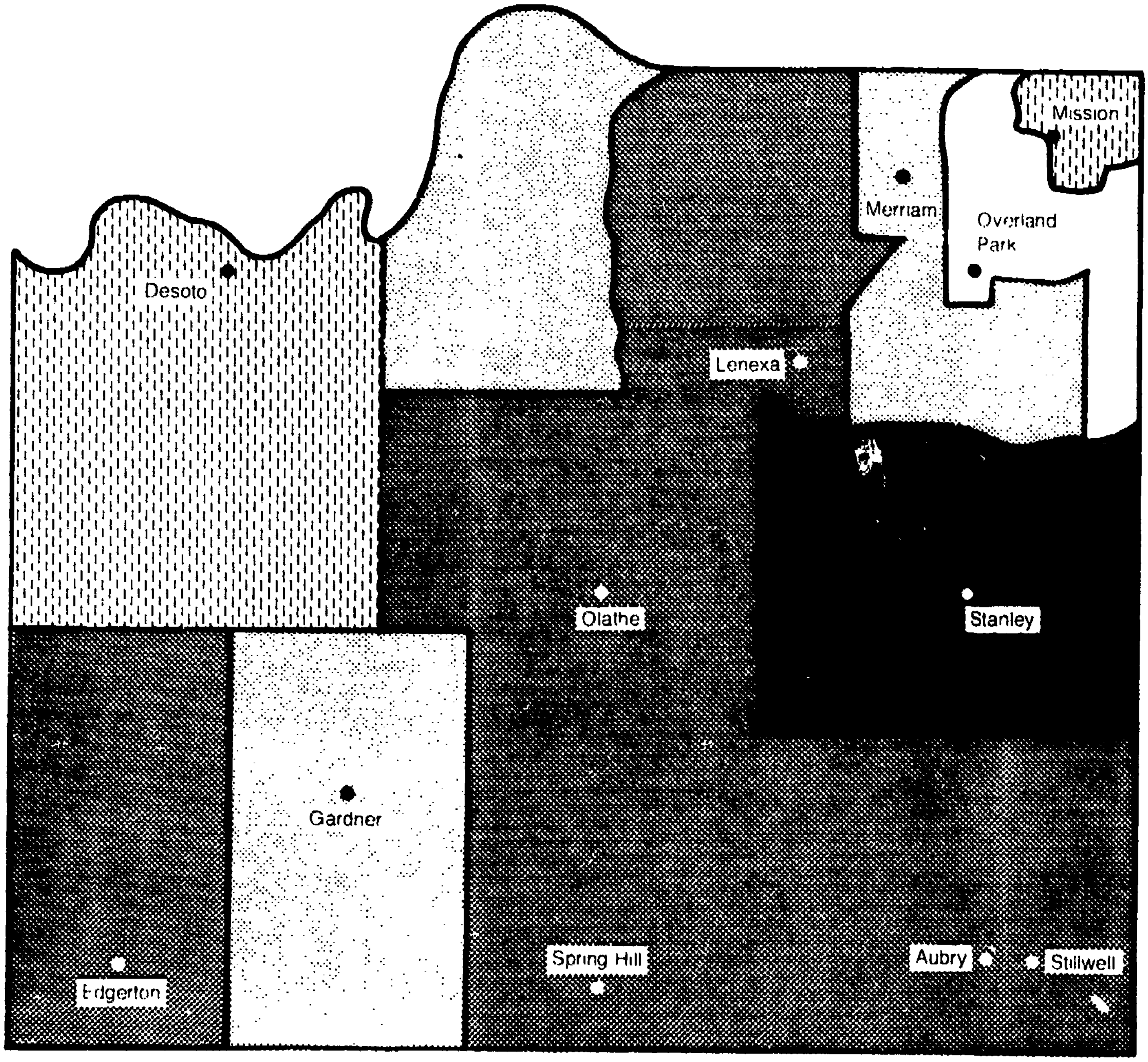


Percent Increase

- 0 - Declining
- 0 - 10% Growth
- 10 - 50% Growth
- 50 - 100% Growth
- 100% or more Growth

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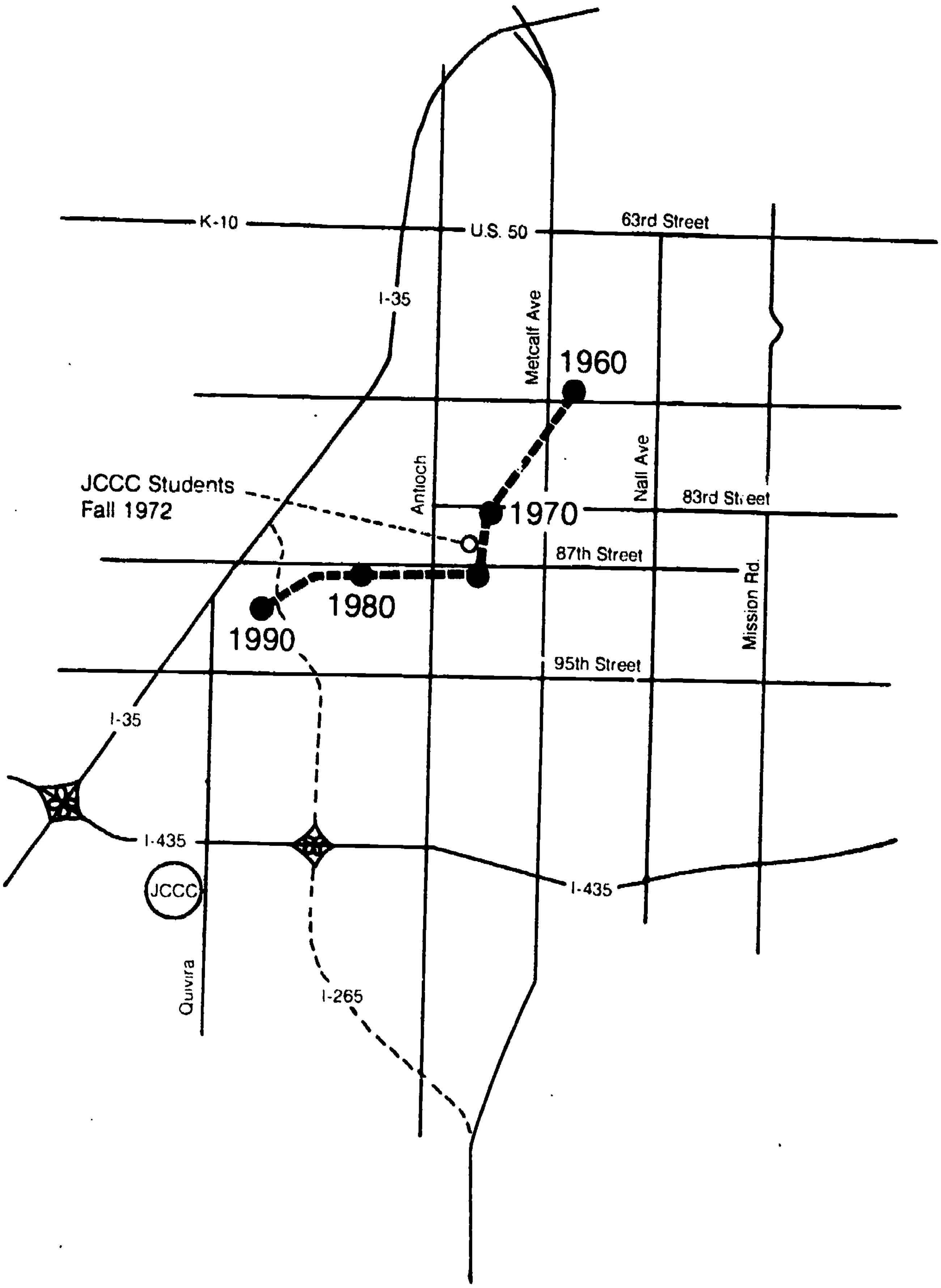
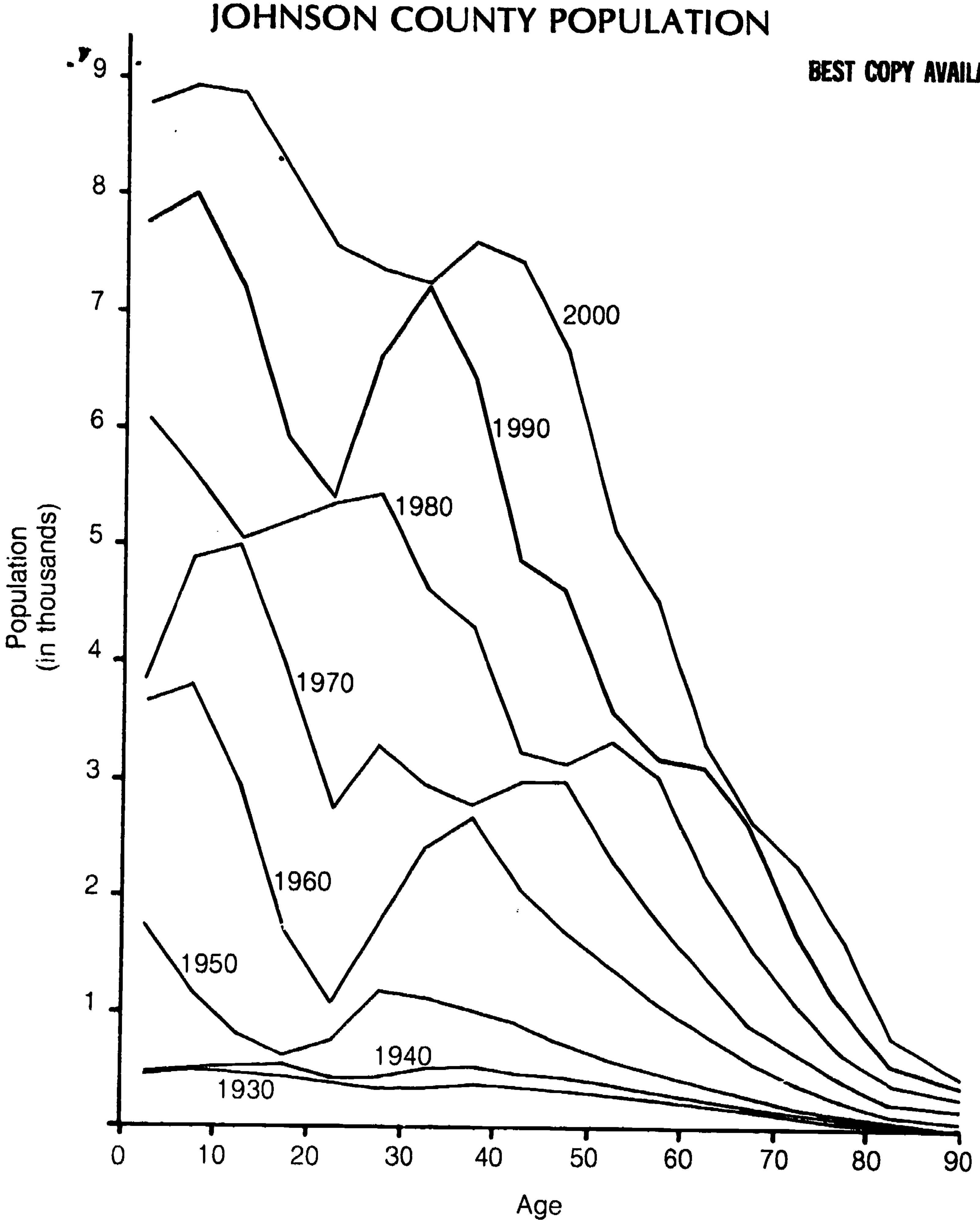
# JOHNSON COUNTY POPULATION CENTROID








*Projection of population age distribution is an essential ingredient in the development of long-range plans for hospitals, churches, educational institutions and other people-oriented agencies. For example, those that provide services for Johnson County senior citizens need to take note that this age group will more than double by the year 2000.*