Demographic and Social Consequences of a Shift from a Growth to a Stationary Population Model for South Dakota Counties: 1960-1970

Sharon Kunkel

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DEMOGRAPHIC AND SOCIAL CONSEQUENCES OF A SHIFT
FROM A GROWTH TO A STATIONARY POPULATION
MODEL FOR SOUTH DAKOTA COUNTIES:
1960-1970

BY
SHARON KUNKEL

A thesis submitted
in partial fulfillment of the requirements for the
degree Master of Science, Major in Rural Sociology
South Dakota State University
1979

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DEMOGRAPHIC AND SOCIAL CONSEQUENCES OF A SHIFT
FROM A GROWTH TO A STATIONARY POPULATION
MODEL FOR SOUTH DAKOTA COUNTIES:
1960-1970

This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable for meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Dr. Robert T. Wagner
Thesis Adviser

Dr. James Satterlee
Head, Rural Sociology Department
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CHAPTER I

STATEMENT OF THE PROBLEM AND OBJECTIVES
OF THE STUDY

Introduction

During the 1960's and early 1970's concern over the world's rapid population growth monopolized both the professionals' and public's attention (Ryder, 1975:3). In the later 1970's the focus shifted to the incipient zero population growth in developed countries. In fact, six countries attained zero population growth during that period: Austria, Belgium, East Germany, West Germany, Luxembourg, and the United Kingdom (Day, 1975:3). The United States appears to pursue the same course, with fertility dropping to below replacement level in 1976 (Spengler, 1977:37).

Zero population growth has occurred among societies in times past. This previous low growth was characterized by high fertility rates and high mortality rates (Spengler, 1978:8). Therefore, no growth was achieved because the high number of births was offset by the high number of deaths. By contrast, the recent zero population growth experienced by developed nations is characterized by low mortality and low fertility. No-growth is achieved through the controlling of fertility to balance the low mortality resulting from advanced medical technology. Because mortality in developed countries has declined to nearly optimum lows, zero population growth as the consequence of controlled fertility is seen as the only possible alternative in a finite world (Nostein, 1970:444).
Statement and Importance of Problem

The United States' population is projected to reach zero growth between the years 2020 and 2065 (Espenshade, 1978:647; Spengler, 1975:3). The Midwest as a region has experienced a steady decline in growth since mid-century and is expected to reach zero population growth before the nation as a whole (Morrison, 1979:11). The shift from population growth to population no-growth is expected to have a number of consequences for a society. Therefore, this study investigates the following:

"What are the demographic and social consequences of zero population growth in South Dakota?"1

The investigation of this problem is important since little empirical research has been done in the area of zero population growth as a result of controlled fertility and its consequences. Historically, the only other country to reach such a stage in development was France in the 1930's, and this stage was relatively short-lived (Day, 1978:3). Consequently, one cannot turn to historical precedents for insights into the consequences of a no-growth population. In fact, most of the literature written on the subject is mainly conjecture.

1For the purposes of this study zero population growth is defined as the condition of a population resulting when the numbers of persons in that population is fixed. This implies that the number of births plus immigrants must equal the number of deaths plus emigrants. A stable population is a population where levels of fertility and mortality are constant, creating a population with an age structure which does not undergo change but remains stable. A stable population which has a zero rate of natural increase is referred to as a stationary population. Therefore, for this study the terms zero population growth and stationary population are used interchangeably.
This problem is also timely since it is projected that zero population growth will soon be a reality in the United States, and even sooner in South Dakota. The possible implications of such a trend should be examined so appropriate state and agency action can be taken, if needed, to anticipate possible consequences and to assist in forecasting such rural services as health, education, and gerontological needs.

**Objectives of the Study**

This study will try to accomplish two major objectives. It will attempt to:

1. Determine to what extent South Dakota is approaching a zero population growth model.
2. Examine selected demographic and social consequences associated with zero population growth in a rural area like South Dakota.

**Organization of Thesis**

The remainder of the thesis is arranged as follows:

1. Chapter II examines recent pertinent literature pertaining to consequences of zero population growth in developed nations, and summarizes the research and writings cited.
2. Chapter III discusses the theoretical framework of the study and states the research hypotheses.
3. Chapter IV contains a description of the methodology used and provides operational definitions for the variables.
4. Chapter V presents an analysis and summary of the study's findings.
5. Chapter VI contains summary, conclusions, implications, and recommendations for further research pertaining to the problem examined in this thesis.
CHAPTER II

REVIEW OF SELECTED LITERATURE

Introduction

Most literature in demography related to zero population growth has centered on the transition period from a growth population to a stationary population, and the questions related to how the transformation could be accelerated (Browning, 1975:57). There is less literature on the many social adjustments that will be necessary during this transition period. This chapter reviews recent pertinent literature related to demographic consequences of zero population growth: population size, age structure, sex ratio, marital status, residence, mortality, fertility, international migration, and internal migration. It also reviews the social consequences of zero population growth: health, education, status and role of women, behavior, social security, public programs, mobility, and economic conditions.

Demographic Consequences

Demographic consequences have been examined in literature according to basic population variables. This section of the review reports literature pertaining to each.

Population size. The population of nations, when they attain stationary conditions, will be substantially larger than they are today, since most nations are still experiencing population growth (Day, 1978:8). The United States is estimated to reach a size
of 250 to 300 million inhabitants before reaching zero population growth around the middle of the twenty first century (Enke, 1973:87; Ryder, 1972:50; and Brinkman, 1971:964). However, the ultimate size of a stationary population is neither the prerequisite for nor a result of zero population growth (Day, 1978:8).

**Age structure.** A number of studies have examined the relationship of age structure to stationary population. Since the age composition of a population influences social behavior and individual personalities, it is probably the most important demographic feature of a stationary population. Spencer states:

> Age composition is, for two reasons, the economically and socially most significant aspect of a stationary population. (1) The economic, political, and other behavior of the representative individual changes with age both (a) because his mental and physical faculties improve with age up to a point only eventually to deteriorate at rates that vary with faculty and individual, and (b) because "capital" embodied in his person—concrete knowledge, learning skill, etc.—accumulates with training and experience up to a point only eventually to waste away as a result of nonreplacement and/or nonreplaceability. (2) Age composition is one among a number of collective or group characteristics that give shape to the physical, ideational, and (perhaps) ideological environment within which behavior takes place and shape. Time preference and expectations at the individual level also vary with age and affect economic and political behavior accordingly (Spencer, 1978:77)

Even though it is not known exactly how large the United States' population will be when it becomes stationary, it is agreed among demographers that it will be older, assuming low mortality continues (Day, 1978:8; Westoff and Westoff, 1971:336; Sheppard and Rix, 1977:1; and Spengler, 1977:16). Sheppard and Rix (1977:1) predict that the
proportion of elderly, people aged 65 and over, will increase from 10 percent in 1970 to nearly 17 percent in 2030.

Figure 1, taken from Day (1978:5), compares a hypothetical stationary population, the United States population in 1976, and Mexico's population in 1976. The striking feature about the populations is the difference in the age composition as revealed by the shape of the pyramids. The stationary population has a cylindrical shape with births reflecting the pattern of the previous cohort. The peaks and troughs as seen in the 1976 United States' population, caused by fluctuating fertility levels, are absent.

Figure 1. Stationary population age-sex structure and contrasts.
Shanas and Hauser (1974:80-81) compare a modern population age structure, that of the United States in the mid-1970's, with a modern-stationary population. The growth rate for a modern population is one percent annually, based upon a crude birth rate of 20.4 and a death rate of 10.4. In the modern population the median age is 32.8 years, with a life expectancy at birth of 70 years. The dependency ratio, the number of persons in the nonworking years (under age 20 and over age 64) to each 100 persons in the working years (age 20-64), is 8.4. Of the dependents, over three fourths are children and youths and less than one fourth are elderly. By comparison, the modern-stationary population has zero growth rates, balanced crude birth and death rates, a median age of 40.0, and a life expectancy of 77.5 years. The dependency ratio would drop slightly to 7.9, but 60 percent of the dependents would be children and youth and 40 percent would be elderly.

Day (1978:9) points out that this 'aging' of the population in a stationary state results not from declines in birth rates, but from the abnormally large increase in birth rates that occurred after World War II, the cohorts of which have advanced to elderly age status. Spengler (1977:16), however, concludes that as a population moves toward zero population growth, the relative number of older persons is bound to increase.

Sex ratio. Two studies have examined the association between sex ratios and population structure. According to Day (1978:10), the sex ratios of stationary populations will show a slight excess of men over
women up to age 48. This is in contrast to the United States in 1970, where women outnumbered men at every age over 18.

Among the elderly, age 65 and over, women will continue to outnumber men, with 136 women for every 100 men (Shanas and Hauser, 1974:90).

Marital status. Little research has been done relative to marital status and zero population growth. Day (1978:19), however, projects that due to a more stable sex ratio, a stationary population will not experience a 'marriage squeeze.' A 'marriage squeeze' is the situation that occurs because social custom decrees that a groom should be two years older than his bride. There are, on the average, only 77 men to every 100 women who are in an eligible age pool. Consequently, some women marry younger men, others postpone marriage, and some do not marry at all. A stationary population would lessen demographic pressures toward any of these choices. Day (1978:10) states, however, that such a stability carries with it no implication for the pattern of marriage. There is nothing about a stationary population that would foster one pattern of marriage over another. It would simply remove the demographic barriers to remaining single against one's will.

Relative to elderly women, Shanas and Hauser (1974:90) state that since women will continue to outnumber men in the 65 and over age category, most elderly men will be married whereas most women will be widows. This difference in marital status results from three factors. Firstly, women will continue to outlive men, especially since the
decline in the birth rate will reduce female mortality due to childbearing ailments (Shanas and Hauser, 1974:89). Secondly, men tend to marry women younger than themselves so there are more eligible mates for elderly men to marry. And thirdly, because of the excess of women in the elderly age group, an older widower has more opportunities for remarriage than are available to older widows (Shanas and Hauser, 1974:84).

**Residence.** A stationary population would require no particular distribution by residence. It could be predominantly rural or urban. Day (1978:12) suggests, however, that in viewing populations that today approximate a zero growth rate, there seems to be a continuance of the past trend toward metropolitanization. Morrison (1979), however, disagrees with Day's observation. He (1979:9) contends the residential pattern in the United States is generally shifting toward smaller-sized communities, a phenomenon he terms "deconcentration."

This deconcentration is taking on three forms:

1. **Major** metropolitan areas are beginning to stabilize and decline while smaller metropolitan areas are gaining residents.

2. The traditional pattern of suburban spillover is expanding beyond the metropolitan fringe and producing satellite towns.

3. Some people are actually moving into truly remote rural areas (Morrison, 1979:9).

Brinkman (1972:971) echoes Morrison's contention that zero population growth in the United States would influence a movement of persons away from larger metropolitan cities into intermediate sized
cities. Brinkman (1972:971) believes this shift will occur as a way to overcome the social costs of pollution and social ills in major cities. He also states that due to reduced farming opportunities caused by the nearly stabilized demand for agricultural products, the rural areas in the stationary United States, especially those with low population density, will decrease in population below the minimum needed to provide many services and to attract nonagricultural industries. This movement, Brinkman (1972:971) states, will induce small towns to cooperate with other small towns to create a larger, integrated, multi-county community. Government assistance for the rural areas is seen as a possible hope for the survival of small rural towns in a zero growth population (Brinkman, 1972:971).

Mortality. Low mortality is assumed by nearly all researchers to be a characteristic of stationary populations. Day (1978:12) comments that higher mortality could continue among certain occupational and disadvantaged groups and among those "persisting in life styles characterized by heavy smoking, overeating, lack of exercise, or dangerous driving."

Ryder (1973:50), discussing the Bureau of the Census prediction that expectation of life at birth will rise by the end of the century to 72 years, states that large improvements in our control over mortality would result in only a small improvement in overall life expectancy. He states:

For example, a 20 percent decline in the mortality rate at every age would result in a increase in life expectancy of less than 5 percent. The reason the increase is
proportionately so small is that in a low-mortality population like ours, those who would be spared death are mostly so old that the additional years of life they can expect are, in any event, few (1973:50).

Because of the higher proportion of elderly within a stationary population, Day (1978:12) contends that death will be a more frequent experience in a person's life, which could lead to the development of sounder social supports than now exist for the dying and the bereaved.

**Fertility.** Fertility in a stationary population is such that the annual number of births plus immigrants equals the annual number of deaths plus emigrants. Most researchers, when discussing fertility, refer to replacement level fertility, approximately 2.1 children per woman during her childbearing years, as that level necessary to achieve zero population growth (Evans, 1975:45; Kreps, 1977:4). However, Spengler (1977:15) notes that a fertility level of 2.1 will maintain a zero growth rate only if immigration is assumed to be zero. To maintain a zero growth rate with a net immigration of 400,000, the native population in the United States must maintain a fertility level of 1.97 instead of 2.1.

The fertility pattern within a stationary population, according to Day (1978:12), could range from that of a small number of women having five or six children each to a universal childbearing of two children per woman. As long as the annual number of births plus immigrants equals the annual number of deaths plus emigrants, who actually bears the children is of no consequence in maintaining zero population growth. However, the two-child family is seen as the most
plausible occurrence in the future stationary population, given our present social attitudes and customs (Spengler, 1977:15).

**International migration.** If a population is to remain stationary, the level of immigration must be accounted for and balanced by corresponding changes in the rate of natural increase. The Bureau of the Census has set the level of immigration at 400,000 persons per year for the purpose of estimating future population size, a figure which they assume will continue for the indefinite future (Spengler, 1977:15). Ryder (1973:49) feels this figure is too high and that legislative action will be taken to reduce the migratory flow substantially as population growth approaches zero. Spengler (1977:15) states that legislative action is already being urged as the number of illegal aliens from the southern borders of the United States continues to rise. In addition, a stationary population with a stable age structure, labor force, and somewhat stable job market would be less likely to attract immigrants, legal or illegal, than a developing nation with a large, expanding job market (Day, 1978:13).

The existence of any international migration into a country has a number of influences on that population. Migrants tend to be concentrated in the young adult, childbearing ages, thus having an effect on educational services, employment and unemployment rates, and other social services (Ryder, 1973:49). Spengler (1977:16) implies, however, that if immigration continues at current levels most predictions regarding the United States and a stationary population would not be altered.
Internal migration. Zero population growth on the national level does not imply a corresponding cessation of growth for local areas, since migration will cause some areas to grow while others decline in population (Espenshade, 1978:664). Day (1978:13) states on first examination it appears that migration would lessen due to the fewer number of young persons. Migration is age selective, with young persons moving when leaving school, taking a job, marrying, and entering military service. It is presumed that internal mobility will decline in a stationary situation due to the low proportion of young adults. This might be counterbalanced, however, since higher migration related to post-retirement moves by the increased proportion of elderly may also result.

Brinkman (1972:971) foresees the direction of internal migration under a stationary population to geographically move from the North (larger cities) and Central Plains (rural areas) to growing areas in the South, Southwest, and West. Generally, the movement is predicted to be away from large cities (with pollution and high crime rates) and rural areas (with reduced farming and business opportunities) to smaller metropolitan areas or intermediate-sized cities (where business florishes) (Brinkman, 1972:971). Morrison (1979:9), who also notes this decentralization movement, believes this trend will continue in a stationary population.

Day (1978:14) stresses that whatever the amount or direction internal migration assumes, it is the result of social and economic factors and not the direct result of attaining a zero growth rate.
Social Consequences

The results of a zero population growth are of two types: those arising from the absence of growth itself and those arising from the age and sex structure associated with this absence of growth (Kreps, 1977:5). Day (1978:15) states that there is no causal relationship between social patterns and the absence of growth in a society, but a population's size and composition set limits on the social patterns. "A stationary population would only make the 'good life' more attainable, it would not, in itself, produce it" (Day, 1978:15).

This section of Chapter II will examine those areas susceptible to change as a result of the age and sex alterations in a population as it moves towards a stationary state.

Health. A zero growth population will not only have a large proportion of elderly persons, but also a high proportion of those at the very oldest ages (Shanas and Hauser, 1974:84). These age groups are highly associated with increasing disability, the need for somewhat constant care and greater demands for social services. Day (1978:17), one of few demographers to deal with health in relation to zero population growth, points out that aging is as much a social and psychological process as a biological one. Given conditions that enable an older person to remain active and useful (therefore retaining a status, livelihood, and some degree of predictability concerning the future), the elderly portion of a stationary population may contain a smaller proportion of 'aged' in a social, psychological, and, possibly, physical sense than is true today (Day, 1978:17).
Ryder (1973:54), when speaking on the notion that older people are less productive than younger ones, states that arithmetic age cannot be regarded as a constant: "... the sixty-year-old today may be in as good shape as the fifty-year-old a century ago." This is not to deny, however, the possibility of greater incidence of chronic ailments and disabilities with a more aged population. Richards (1974:5-6) calculated that a stationary population would have slightly higher incidences of functional, organic, and old age psychoses. Still, according to Day (1978:17), the way in which an aging population manifests itself is explained less by the consideration of physical age than by socioeconomic and environmental conditions.

Shanas and Hauser (1974:89) speculate that with better living conditions for the young made increasingly possible with lowered birth rates, better health among women, a general improvement in environmental conditions, and medical breakthroughs to eliminate major causes of death, the general health of those in the aged group in a stationary population could be improved over that of the elderly today.

**Education.** Consequences of a stationary population for education are the result of the age structure of such a population. With a declining fertility rate, there will be fewer students to educate both during the transition period and when a stationary population is attained. Since elementary and secondary schools have mandatory attendance, the demand for education closely parallels trends in the population ages 6 through 17 (Espenshade, 1978:661). Day (1978:23) also states that there will be short run fluctuations in the demand
for schooling as the population approaches no-growth. Whether reductions in the number of school age children will lead to an improvement in educational quality or be used as an opportunity to cut costs and allocate resources elsewhere cannot be answered. Espenshade (1978:661), however, cites a Bureau of the Census publication predicting the quality of education for the years 1970 to 2000 will rise, with the government spending a smaller fraction of the gross national product on education.

Economists have studied the implications of zero population growth on higher education. Espenshade (1978:661) points out that demands for higher levels of education are greatly responsive to economic and social changes, so one cannot be confident in estimating the effects of zero population growth on higher education enrollment patterns. Evans (1975:48-49) argues that continued education beyond high school is viewed by the consumer as more of a voluntary investment in one's future than is true of lower levels of education. He also holds that a stationary population will develop a more 'mature' taste in educational priority:

Society will demand education as much for its consumption value as for its investment potential. Education will be for the young and old, and it will be as much part time as full time. Moreover, it is quite likely that the emphasis is on degree per se will be considerably modified not only in the subject matter but also in importance as a rationale for study (Evans, 1975:48-49).

Therefore, the movement to zero population growth is seen by some as improving the quality of elementary and secondary education and creating a greater demand for higher education among all age levels.
Status and role of women. The lowering of the fertility rate, which accompanies the arrival of a zero growth rate, has a number of consequences for the female population. Most researchers agree that in a stationary population labor force participation among women will increase (Spengler, 1977:31; Browning, 1975:57; and Brinkman, 1971:965). Day (1978:26-27) states that this occurs due to the lengthening of the 'empty nest' period for women. Since fewer children are born, women will have more time to do other things besides childrearing.

Keller (1972:273) lists eight characteristics of a low fertility population: (1) women in the labor force full time, (2) women with career commitments, (3) women with advanced degrees or higher levels of formal education, (4) a high degree of social and geographical mobility of couples, (5) a concern with the quality of child care and parenthood, (6) lesser participation of women in their kinship networks, (7) lesser participation in home-centered leisure among wives, and (8) moderate satisfaction with one's marriage.

Day (1978) echoes Keller's eighth consequence. He states (p. 26) that because of the reduced number of children in a family, men will be forced to view their wives as more than simply child rearers. This will put more pressure on the husband-wife relationship and enhance its importance in a marriage. Also, the occurrence of divorce will probably increase, not so much because of more marital discord, but because one of the barriers to divorce, presence of children, will be
lessened. This, in turn, will lead to a higher incidence of single females.

Behavior. A major concern expressed relative to a stationary population is age structure. There is some fear that the older stationary population will be less receptive to change and will have a strong tendency toward conservatism. Day (1978:27) reports that a society with an older age structure "...would not be likely to be receptive to change and indeed would have a strong tendency towards nostalgia and conservatism" (see also Ryder, 1973:55). Westoff and Westoff (1971:337) explain the occurrence of conservatism in older age groups to the lack of prior schooling among those age groups. They claim that as the educational level of the older age groups increases, which is predicted to occur in a stationary population, age will no longer be equated with conservatism.

Day (1978:28) expands this argument. He claims that conservatism cannot be equated with age, even today. He cites a number of studies, one of which found the average age of 'liberal' voters in Congress during the 1948-49 term to be higher than the average age of the 'conservative' voter. Therefore, Day claims that the aging of a stationary population will not affect political behavior in the sense of the population becoming more conservative. However, Day states (p. 36) that the older population, due to their increase in numbers, will command more political power than has been true in the past. As a political entity they will be concerned about inflation control more than unemployment, the latter a major concern of younger age groups.
The shift in age structure in a stationary population is expected to influence criminal behavior. Day (1978:30) states that about half of all arrests in 1974 occurred in the 15-24 age group and another tenth in the 25-29 age group. This imbalance was even greater among arrests for violent crimes. A decline in the number and proportion in these age groups, therefore, should be associated with a substantial decline in the crime rate.

Social security. A stationary population can be expected to place a greater burden on the working force to support the growing number of aged. Espenshade (1973:659) states: "... fertility reduction means an inevitable change in a population's age composition, increasing the proportion over age 65, reducing the proportion in young age groups, and leaving approximately the same proportion in the working ages." Because the proportion in working ages does not increase in a like proportion to the aged population, the burden on the working force to support these older people increases.

Some argue that the financial burden of a growing number of older dependents in a stationary population will be offset by the decreasing number of younger dependents. Spengler (1977:16) dismisses this argument by pointing out that the cost of supporting an old retiree is three times as great as the public cost of supporting a young dependent. Also, Ryder (1973:55) comments that the family, an effective institution for the care of young dependents, is inadequate as an agency for the care of aged dependents in a post-industrial era.
The problem of supporting an increased number of aged dependents is caused, in part, by the structure of our Social Security system. This pay-as-you-go system requires those who are presently working to pay the benefits of those retired (Turchi, 1975:78). Turchi (1978:78) points out two reasons why this system does not work. Firstly, workers with only a few years of covered employment, and, therefore, only a few years of paying into the system, have been systematically retired with full benefits. Secondly, while the number of workers contributing to the system doubled between 1950 and 1972, the number of beneficiaries increased almost eightfold. This problem is aggravated by the fact that retirement benefits have increased even more rapidly, multiplying more than 43 times during that period. Turchi, among others (see Espenshade, 1978:659), concludes that the pay-as-you-go system prevailing in the Social Security program cannot be maintained indefinitely in a stationary population.

If the Social Security system is continued in a stationary population, Turchi (1975:81) foresees three impacts it could have on the population. Firstly, there would be an increase in the relative transfer of goods and services from the working population to the aged population, thus increasing the real burden on the working population (see also, Espenshade, 1978:651). Secondly, aggregate savings would be reduced since the disposable income of the working population would be lessened and the existence of the Social Security system would discourage saving for retirement. Thirdly, with Social Security benefits now available as early as age 62, the trend toward early
retirement would further increase the burden on the work force and
could create labor shortages in a stationary state (see also,
Sheppard and Rix, 1977:4).

Simply raising the retirement age, however, may not relieve the
tax burden on the working population (Espenshade, 1978:659). If the
elderly have trouble finding employment, the impact of old age as-
sistance may simply be shifted from Social Security to some other
public transfer system. Also, according to Sheppard and Rix (1977:6),
the pressure for early retirement may grow stronger as younger members
of the work force are faced with fewer advancement opportunities as
the average age of the population increases.

Public programs. Other public programs may also be affected by
the age structure in a stationary population. For example, Espenshade
(1977:663) states that poverty and welfare programs might increase
since the portion of the population most in need of such programs,
the elderly, will increase and have fewer children to look after them.

Also, Wertheimer and Zedlewski (1978) studied the Aid to Families
with Dependent Children program. They found that payments in real
terms remain fairly constant over time, reflecting their susceptibil-
ity to inflation. However, the divorce rate, which is predicted to
rise in a stationary population, was found to have the greatest influ-
ence on the Aid to Families with Dependent Children program's case-
load, with a higher divorce rate creating a higher caseload.

Day (1978:36) comments that a stationary population is likely to
put more emphasis on the quality of public services for children. With
more women in the labor force, there will be greater pressure for the community to provide conditions that furnish both safety and earlier independence for children, such as day care centers and Head Start programs. In general, Day concludes (p. 36) public programs in a stationary state will provide more support for individuals at all stages in the life cycle.

**Mobility.** Because in our system power and prestige are determined, in part, by length of service, a stationary population with low mortality will provide less opportunity for promotion. Since people will be living longer and a greater proportion of the population will be older, few opportunities will be afforded the young adult as fewer positions will open as the result of retirement and death (Day, 1978:24).

Keyfitz (1973:335) states: "One of the consequences of moving towards the inevitable stationary population is that mobility will become more difficult." Keyfitz (1973) sets up an equation for determining the relation between individual mobility and population increase, and then applies the equation to determine the age of promotion to a given rank in a stable organization. He found (p. 348) that in a stable organization the long-term average delay in age of promotion to the middle levels of an organization was about four and one-half years. Keyfitz then suggests three possible ways to mitigate the 'depressing effect' a no-growth population may have on personal mobility. Firstly, he suggests (p. 348) increasing the "markers of social status." Jobs, he contends, can be broken down
into different ranks, such as Foreman Grade I and Foreman Grade II, to allow for more frequent promotion. Secondly, the effects of a slowing mobility could be eased by making social status and mobility less important in the society. And, thirdly, Keyfitz believes that by applying technical advance to change such structures as productivity and real income, "... people may become more concerned with pay and the goods they can buy than with rank and title" (1973:348).

Spengler (1977), in discussing mobility, distinguishes between vertical mobility and horizontal mobility. He concludes that in relation to vertical mobility the access of younger persons to higher-status jobs is more restricted in a nongrowing than in a growing population, since relatively more of the higher-status jobs fall to older persons. Horizontal mobility, according to Spengler, is also more difficult in a stationary population. The withdrawals from the labor force by people due to retirement and death are just somewhat offset by the number of persons entering the labor force, thus reducing horizontal mobility. However, Spengler states:

While the advent of a stationary population and the consequent shrinkage in the relative size of the mobile reserve component of the labor may make more difficult the maintainence of optimum interoccupational balance, this difficulty can be overcome if an economy is flexible, free of monopoly-preserving barriers to interoccupational mobility, and equipped with satisfactory means of gathering and diffusing information bearing upon the supply of jobs and the demand for them in the present and the near future (1977:26).

Browning (1975) divides mobility into two classes. He uses the classifications of exchange or individual mobility and structural or group mobility. Exchange mobility is the vertical movement of
individuals from one hierarchically located position to another. It does not require any change in the number of positions, only movement among them. Structural mobility refers to the alteration in the positions themselves that affect the mobility chances of large numbers of people. Browning studied structural mobility by investigating indicators of change in five areas as he predicted them to occur in a stationary population. The five areas of structural change include: population distribution, the labor force, bureaucratization, education, and parentage. He found that during the period 1900 to 1970, the five areas and their indicators all moved in ways that fostered structural and, therefore, individual mobility. Although these same trends were seen for the 1970 to 2050 period, most of the trends had "lost much of their force" (Browning, 1975:65). Therefore, Browning concludes, in addition to the other arguments made by demographers, that structural mobility would become less favorable for individual mobility in a stationary population. However, Browning qualifies this:

On the face of it there is no inherent reason why stationary populations can't be dynamic and capable of fostering considerable mobility. If the labor force is conceived of as a set of structured and hierarchically arranged positions, and if under the conditions of a stationary population and a "mature" socioeconomic structure the rate of change in both the number and the kind of positions is lower than at present, there still can be a good deal of mobility by shifting persons in and out of positions (1975:66).

Browning also dismisses three proposed ways of stimulating mobility: (1) Keyfitz's idea of creating more markers of social status is rejected on the grounds that such a contrived distinction would not be accepted as real; (2) increasing non-vertical mobility through
migration of people would be hard to promote on a large scale basis without more governmental 'control'; (3) both delayed entries and early exits from the labor force can enhance mobility but are very costly in other ways for the society involved. Browning suggests (p. 68) that multiple careers could foster mobility by increasing circulation among positions without increasing the number or kind of positions. This would permit individuals to engage in two or more careers in their work life by switching to a different arena after moving up through the hierarchy in one line of work. Browning, however, recognizes that any form for stimulating mobility would be difficult, but he sees the idea of multiple careers as an innovative solution.

Not all researchers are so pessimistic about the future of individual mobility in a stationary population. Day (1978:24) suggests five different consequences, not all of which are unfavorable, for a stationary population with a decrease in mobility. Firstly, a decrease in status mobility could lead to less internal migration, as fewer executives and professionals are moved about to 'higher' positions. This would tend to stabilize neighborhoods and would help lessen inflation. Secondly, the lessened opportunity for promotion could, by contrast, lead to more, rather than less, internal migration, as people seek other associations to avoid the perceived restricted promotion opportunities where they currently are. Thirdly, a decrease in status mobility could result in a competition based on familial rather than individual achievement, since women will be participating
in the labor force in greater numbers than ever before. Competition would be more on the basis of income rather than position or promotion. Fourthly, the adoption of more stringent retirement practices in order to force open more positions of power and prestige may occur. But in a society where few alternatives for work are given the aging and employment is still an important social and psychological activity, it is doubtful whether this would actually happen. Fifthly, the reduction in status mobility could produce a decline in competitiveness and aspiration as socially accepted values. This could result in reduced status frustration, since people would view promotion as socially disruptive and unattainable. Furthermore, fewer persons would be viewed or would view themselves as 'failures,' since not being promoted within one's profession would no longer be viewed as 'failing' (Day, 1978:25).

Reddaway, commenting on the belief that a stationary population implies reduced mobility due to this smaller ratio of newcomers to established workers and younger workers to older, states:

Both of these points are qualitatively correct, but I am not much interested in them, because there seems to be such a large amount of movement of workers now, that any real demand from an expanding industry should still be met without too much difficulty. Moreover, highly specific demands will call for special measures in training, anyhow, and individual problems on the workers' side will need special measures, whatever is happening to the total labor force (1977:28).

The majority of researchers, then, believe that a stationary population will generate decrease in mobility opportunities. This decrease is viewed as having both positive and negative consequences.
Some suggest that there are ways to stimulate mobility that will be appropriate for a stationary population.

**Economic conditions.** Most of the literature that has been written about stationary populations has been on economic consequences of such a state. Many economists have predicted that a cessation in population growth will have a negative effect on the economy. However, most such economists are equating a no-growth society with a no-growth economy. Since this study does not assume a no-growth economy to be synonymous with a no-growth population, literature that does make this assumption will not be reviewed (see Boulding, 1973 and Brooks, 1973).

Consideration of the economic consequences of a stationary population can be divided into four overlapping areas: savings, investments, consumptive patterns, and the labor force.

Ryder (1973:51) believes, in general, that the lower dependency ratio which characterizes a stationary population will make feasible more savings and investment, more formation of capital, and, accordingly, higher productivity and per capita income. Enke (1973:91) agrees that with fewer dependents per work-age adult, a higher rate of private savings will occur. Spengler (1972) also argues that a stationary population enhances the opportunities to save. Espenshade (1978:658) cites work done by Resek and Siegel that provides partial empirical support for these contentions; however, Espenshade contends that family savings are more a function of the average age of children than the number of dependent children.
Day (1978:19) believes that, relative to capital formation, individuals are of little importance as sources of capital in industrial economics. Business confidence is by far the most important criteria. Day states that business confidence has been low during periods of rapid population growth and high during stable population periods.

Public saving is predicted to increase in a stationary population. Brinkman (1972:965) states the government would have lower expenditures in the areas of education, welfare, housing, and social services; therefore, more public saving. These savings in government expenditures could permit economic growth to be expanded by providing opportunities to re-direct investments into growth-promoting activities (Brinkman, 1972:965). This stimulation of the economy may be necessary, Brinkman states, since investments could decline somewhat if investors become pessimistic in anticipating a stationary population. Enke (1973:91) echoes Brinkman's belief that there will be more public saving in a stationary population due to less expenditures for education and welfare.

Espenshade (1978:658) states that the proponents of the stagnation thesis believe that a slowdown in population growth will lead to reduced consumption, reduced investments, and eventually, to less than full employment. Ryder (1973:52) believes incongruities in future investment do not lie with reduced consumption but with possible changes in consumption patterns. These changes in consumptive patterns could lead to a more problematic context for the potential investor, thus making investments a more risky business. However,
Ryder (1973:53) considers the possibility of increasing the size of a population, "... merely to increase the supply of well-nigh risk-free investment opportunities..." a perverse option. Ryder concludes: "... purely demographic characteristics are probably of relatively small importance as determinants of the development of capital equipment, employment levels, and the pace of social change, and therefore the economic efficiency of a society."

Consumptive patterns, as it has been stated, will probably change in a stationary population. Day (1978:20-21) projects that due to the changing age structure, the demand for the automobile will lessen and the demand for housing will favor dwellings which provide "more rental units, higher densities, closer proximity to shops and services, and better design from the standpoint of ease and cost of maintenance, energy consumption, health, prevention of undesirable noise, aesthetics, and accessibility to community life." Brinkman (1972:965) believes that the greatest growth in demand in a stationary population will be among commodities with "high income elasticity," such as recreational activities, personal services, and airline travel. Eilenstine and Cunningham (1972) conducted a study to project consumption patterns for a stationary population. They found (p. 226) that a stationary population has more spending units than a growing population. This reflected the older population. Eilenstine and Cunningham conclude (p. 230): "The consumptive patterns of a stationary population are sufficiently like those associated with a growing
population, so that there is no real reason to fear economic disorder from this source with the cessation of population growth."

Labor force is one of the most direct channels through which changes in size and composition of the population exert influences on the economy. Ryder (1973:53) states that many researchers fear the fact that a stationary population will have an older average age for its work force. He believes myths persist in this area, since there is little hard evidence to refute them. Two circumstances are seen to confound the meaning of age for individual behavior. Firstly, most research confuses the significance of age as a stage in a person's life cycle and age as an identifier of his location in historical time. Ryder points out (p. 53), "... the behavior of those now over 73 reflects mainly the fact that they were born in the nineteenth century." Secondly, behavior at any age is only partially the consequence of the characteristics an individual brings and mostly a consequence of society's expectations for a person that age.

The labor force in a stationary population is likely to have a larger proportion of older, female and white-collar workers (Espenshade, 1978:650). Espenshade also reports (p. 651) that the availability of jobs requiring little education is likely to decrease in the future, along with the supply of poorly educated workers.

It is frequently imagined that an older labor force will be less productive because the advantages of experience are outweighed by the relative reduction in the number of youthful and more energetic workers who have just recently finished their formal education
(Espenshade, 1978:651). But there is little empirical support for such a conjecture. Serow (1976) conducted a study in which reduced fertility was found to yield a slightly higher productivity because of a more favorable age composition and a higher capital-labor ratio. Success is often equated with youth and education, but the underlying assumption is that training ceases upon entry into the work force. Ryder (1976:19) speculates that education in the future will become more of a lifelong continuous process.

It has also been hypothesized, on the grounds that age and creativity are inversely related, that the rates of innovation and technological progress will be slower in an older work force (Espenshade, 1978:651). However, Sweezy and Ownes (1974) study of Nobel prize winners suggests that the age group of maximum creativity (35-44) is the age group that will show the smallest change in the transition from population growth to population stabilization. Day (1978:34) suggests, furthermore, that the older age composition may even stimulate creativity by preventing excess numbers of creative individuals from being promoted to administrative positions, which normally provide fewer opportunities for creative endeavors.

Considerable attention has been given to the belief that older men are less willing to change jobs, particularly if the job involves a change in residence. The older worker has a vested interest in his work and his place of residence. Ryder (1973:54) feels that this could mean that it will take longer for a young person to achieve a reasonable position in an older organization. Concurrently, the
young, with recent education, fewer relative numbers, and more willingness to move among jobs to attain rapid advancement, will be in a favorable position. Thus, the same characteristics that make the occupational structure of an older society, as a whole, less adaptable, make it possible for the young to avoid the penalty of remaining in an older organization with fewer advancement opportunities.

Day (1978:17) suggests that any possible undesirable economic effects of older worker's resistance to job changes could be largely offset by more employment of "marginal" workers: students, the disabled, mothers with young children, and older women with little work experience, all of whom do not have the same interest in maintaining a specific occupational status quo.

Day considers (p. 21) one last point about economic conditions in a stationary population: economic forecasting. With stabilization of population growth, the absence of humps in age cohorts would make forecasting more certain. However, if internal migration is high, local and regional forecasting will continue to be fairly uncertain.

Although there are many negative concerns about the implications a stationary population will have on economic conditions, most researchers' conclusions are more positive. Ryder concludes it:

... is important first to recall that no realistic projection suggests that there will be any more than a small change upward in the average age of the labor force; certainly there will be less change than has occurred during the past century and even that change has had insufficient impact to attract social or economic commentary. Secondly, the demographic changes that will occur are probably of less significance numerically than future changes in the ages at which people enter into and exit from the labor force (1973:55).
The United States Commission on Population Growth and America's Future stated:

... in the long run, no substantial benefits will result from further growth of the Nation's population, rather that the gradual stabilization of our population through voluntary means would contribute significantly to the Nation's ability to solve its problems. We have looked for, and have not found, any convincing economic argument for continued population growth. The health of our country does not depend on it, nor does the vitality of business nor the welfare of the average person (1972:4).

Finally, Reddaway (1977:29) stated that the negative economic effects of a stationary population will be small, but on the social and environmental side, the advantages from not increasing the number of people "... seem to me very real."

Summary. Research indicates that there are many unanswered questions as to the demographic characteristics and social implications of a stationary population. When the United States finally reaches a stationary state, around 2035, it will have a population size of 250 to 300 million people. The population will be older, with a dependency ratio around 8.4. More dependents will be in the over 65 age group than is true today. The sex ratio will show a slight excess of men over women up to age 48; thereafter, women will outnumber men. Marriage patterns cannot be foretold with certainty, but fewer women will remain single who wish to be married. Residential patterns will shift, with declines in large metropolitan areas and rural areas and increases in the intermediate towns and cities. Fertility rates will continue around the 2.1 level, or 1.97 if there is immigration. Mortality rates will continue to be low.
International migration will be more strictly regulated but will probably decline as job opportunities for people with little education decline. Internal migration could decrease due to a lower number of young adults, but this may be counterbalanced by the increase in the number of elderly that make retirement moves.

The social consequences of a stationary population are mostly due to the change in the age structure toward an older population. Health-wise, a stationary population may be able to classify fewer of its elderly as 'aged' than in our present population, if conditions are created to allow the elderly population to remain active and useful and there continues to be improvement in medical technology.

The education system in a stationary population will have fewer children in the elementary and secondary ages, thus providing the opportunity to increase quality without increasing expenditures. Higher education may become more of a 'consumptive' product, with people of all age groups taking courses.

More women in a stationary population will have definite career commitments; and more women will continue their formal education. Female labor force participation will increase, partially due to reduced family size. Marriage satisfaction will lessen and divorce will increase due to fewer children in the home.

Concern with a movement toward conservatism in a stationary population may be unwarranted as research has demonstrated that age and conservatism are not necessarily positively correlated; however, educational attainment may be an intervening factor.
The future of the present Social Security system is not encouraging. A stationary population with more elderly persons will create a strong need for pension programs, but probably not the Social Security program. The support burden on the working age population can be lessened if the retirement age is increased. This will be a viable option only if there are jobs available for these older persons. Public programs for children will also increase due to the increasing number of working women and the increasing divorce rate.

The consequences of a stationary population on mobility are more complicated and less understood than is true of the preceding areas. Mobility will probably become more difficult as the population moves towards a stationary state, but ways have been proposed to stimulate mobility.

Economically, a stationary society will have a higher per capita income, more households, more private and public savings and, consequently, a positive investment future. Problems may be encountered, but the overall economic outlook is positive. Changes in consumptive patterns will occur, but they will be slight and will not produce a decline in consumption itself.

The labor force will be affected in the transition to a stationary population. Younger workers with formal educations will be in demand, and more traditionally marginal workers will enter the labor force. The fear that productivity with an older labor force will decline is probably unfounded. Creativity levels will not be negatively influenced with the transition to population stability.
Economic forecasting for the nation as a whole may be done with more certainty than before. Overall, the economic consequences of a stationary population will be positive.

The findings that pertain to the nation as a whole appear especially pertinent to the state of South Dakota since most demographers believe that the shift toward stationary population will occur in the Midwest before occurring in the nation as a whole.

The transition to a stationary population may not be without hurdles, but Day (1978:38) concludes: "... the concomitants of a stationary population are far more likely to be desirable than undesirable--both for the society and for the individual."
CHAPTER III

THEORETICAL FRAMEWORK

Introduction

The purpose of this chapter is to provide a theoretical base that will guide further investigation of the specified research problem and provide a logical deductive conceptual framework connecting abstract theoretical concepts to each other and to appropriate empirical variables.

This chapter is divided into two parts. The first, entitled conceptual framework, provides a theoretical orientation to help guide the actual research and develop the conceptual model for interrelating the factors presumed critical to this study. The second states the propositions and hypotheses that develop from the conceptual framework.

Conceptual Framework

In the field of demography, three separate population growth models have been proposed and discussed: a growing population, a slow growth population, and a no-growth or stationary population. Figure 2 displays a population pyramid for each of these population models.
Figure 2. Stationary, slow growth, and rapid growth population age-sex structures.

The rapid growth pyramid is characterized by a 'bottom heavy' triangular shape. The number of children between the ages 0-4 exceeds the number in any other age group (Day, 1978:4). The proportion in each age group is greater when compared to any older age group. The high growth model, then, has high fertility and, due to the low proportion in the elderly age groups, a relatively low life expectancy.

The slow growth model is characterized by a 'squaring' off of the triangular shape that occurred during high growth. The proportion of children between the ages 0-4 is smaller; less, in fact, than the proportion of persons in any successive cohort through age 30-34. The proportion of elderly persons is larger in the slow growth model,
reflecting a higher life expectancy. The slow growth model, then, shows bulging cohorts among the teen and young adult age groups, possessing a capacity for further growth.

The no-growth, or stationary, model is characterized by a nearly perfect cylindrical shaped pyramid. The proportion of each cohort is equal to the next higher until the age 50-54 cohort. Cohorts older than 50-54 reflect gradual attritions as mortality increases. The sex ratio of each cohort approximates 100, except for age groups 70 and over, when the proportion of women becomes slightly larger than that of the men in each successive age group. Theoretically, a stationary population is one in which the annual difference between the number of births and immigrants and the number of deaths and emigrants equals zero, and age and sex cohorts remain proportionately equal. The stationary model is purely hypothetical, since no population has or presumably could conform exactly to it (Day, 1978:6). Yet, it closely resembles the future structure for the United States in light of the present control over fertility and mortality (Day, 1978:6).

These population models provide a conceptual framework for categorizing populations, allowing for comparisons between different populations and between the same population at different points in time.

For the purposes of this study, three concepts shall be used to describe population models: population growth, population slow growth, and population stationariness. A population with an age-sex structure similar to the rapid growth model is experiencing what is
termed population growth. A population with an age-sex structure similar to the slow growth model is also experiencing population growth but at a slower rate. A population with an age-sex structure similar to the stationary model is experiencing population stationariness. For purposes of this study, populations so characterized will be called growth, slow growth, and stationary, and the process of change from one to the other will be called growth, slow growth, and stationariness.

Judah Matras (1977), in *Introduction to Population: A Sociological Approach*, proposes a social structural approach to studying the impacts of population change. He suggests (p. 237) that variations in population size, density, and structure are closely related to variations in social structure. Social structure is defined as including:

1. The set of social roles and positions,
2. The set of institutionalized relationships between pairs of roles and between larger combinations or subsystems of roles,
3. The composition of the population with respect to social roles and to subsystems of social roles, and

Changes in social structure occur under four separate circumstances: (1) when the set of roles changes; (2) when one or more role relationships change; (3) when numbers or proportions of incumbents, in various roles, role categories, or role systems shift; or (4) when
allocation of social rewards, or rules governing conversion and exchange of social resources, change (Matras, 1978:241). Matras concludes that population growth, turnover, or shifts always effect one or more of the above changes in social structure.

Matras outlines the demographic, economic, social, and political responses that occur with population growth and change. Table 1 portrays these system responses and gives various measures of change in these systems appropriate as variables for this study.

**TABLE 1**

**SYSTEM RESPONSES AND MEASURES OF RESPONSES TO POPULATION GROWTH AND CHANGE**

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<tr>
<th>Systems</th>
<th>Responses</th>
<th>Measures</th>
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<td>Demographic</td>
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<td></td>
<td>Urbanization</td>
<td>Mortality</td>
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<td>Family Limitation</td>
<td>Aging of the Population</td>
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<td>Population Control</td>
<td>Proportion of Men to Women</td>
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<td>Economic</td>
<td>Changes in Working Force</td>
<td>Female Participation in Labor Force</td>
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<td></td>
<td>Savings and Investments</td>
<td>Income</td>
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<td>Productivity</td>
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<td>Social</td>
<td>Division of Labor</td>
<td>Educational Levels</td>
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<td>Deviance</td>
<td>Criminal Victimization</td>
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<td>Competition for Space</td>
<td>Female Family</td>
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<td>Changes in Social</td>
<td>Headship</td>
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<td>Political</td>
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The above variables are based upon generalizations derived from the literature and an application of the Matras model to the research problem under study. These are variables specifically predicted to vary as a population moves from a growth model to a stationary model.

**Propositions and Hypotheses**

Therefore, the conceptual framework and the literature review suggest the following theoretical propositions and related research hypotheses.

1. Population changes, such as growth, turnovers, or shifts, effect changes in social structures.

2. Social structures include demographic, economic, social, and political structures.

3. A change from a growth population model to a stationary population model constitutes a population shift.

4. The closer a population is to a stationary state, the more the population's age-sex structure approximates the stationary age-sex structure model.

5. Changes from a growth to a stationary model generate lowered fertility, lowered mortality, higher aging of the population, lowered dependency, higher proportions of men to women, higher female participation in the labor force, higher income, lowered school enrollments, lowered criminal victimization, and higher female family headship.

6. South Dakota is presently experiencing a shift from a growth population to a stationary population.
7. Therefore, the greater the change from population growth to population stationariness:

a. The greater the decline in fertility.

b. The greater the decline in mortality.

c. The greater the increase in the aging of the population.

d. The greater the decline in dependency.

e. The greater the increase in the proportion of men to women.

f. The greater the increase in female participation in the labor force.

g. The greater the increase in income.

h. The greater the decline in school enrollments.

i. The greater the decline in criminal victimization.

j. The greater the increase in female family headship.
CHAPTER IV

METHODOLOGY

Introduction

This chapter discusses the methodology employed for meeting the first and second objectives of this study. Where appropriate, this chapter specifies the unit of analysis, the source of data, the dependent variables, the independent variables, method of analysis, significance level, and null hypotheses.

Methodology for Objective One

The first objective of this study was to determine to what extent South Dakota is approaching a zero population model. This was accomplished by comparing South Dakota's population or estimated population for the years 1960, 1970, 1980, and 1990. Population pyramids were constructed for each year and then compared with the stationary population model pyramid. An index was calculated for each measurement year based on the extent to which each representative pyramid deviated from that characteristic of a stationary model. It was assumed that the closer a population pyramid approximated the stationary model, the lower would be the sum of absolute deviations, and the more closely that population approximated a stationary state.

Methodology for Objective Two

Objective two of this study was to examine selected demographic and social consequences associated with zero population growth in
South Dakota. This objective was accomplished through the testing of ten null hypotheses through the application of correlation coefficient statistics.

**Unit of analysis.** The unit of analysis for this objective of the study was the individual county of South Dakota. All 67 counties were included in the analysis.

**Source of data.** The data measuring the independent variables were gathered from appropriate tables in national and state census and vital statistic publications.

**Dependent variables.** There are ten dependent variables: the first five are measures of demographic responses to population change, variables six and seven are measures of economic responses, and variables eight through ten are measures of social responses. The variables are:

\[ Y_1, \text{ fertility, measured by the absolute plus or minus change in the number of births from 1960 to 1970.} \]

\[ Y_2, \text{ mortality, measured by the absolute plus or minus change in the number of deaths from 1960 to 1970.} \]

\[ Y_3, \text{ aging of the population, measured using the index of aging (Peterson, 1969:69). This was calculated by taking the number of persons 65 years of age and over, dividing the total by the number of children age 14 years and under, and then multiplying this result by 100. The variable, therefore, was measured by the numerical change that occurred in the index of aging from 1960 to 1970.} \]
$Y_4$, dependency, measured by the absolute plus or minus change in the total number of persons under age 20 and over age 64 from 1960 to 1970.

$Y_5$, proportion of men to women, calculated by taking the absolute plus or minus difference between the number of men and the number of women for each of the years 1960 and 1970 and calculating the change between these figures.

$Y_6$, female participation in the labor force, measured by taking the absolute plus or minus change in the number of women reported employed in the labor force from 1960 to 1970.

$Y_7$, income, measured by taking the absolute plus or minus change in the median income from 1960 to 1970.

$Y_8$, school enrollment, measured by taking the absolute plus or minus change in the number of persons enrolled in kindergarten through the fourth year of high school from 1960 to 1970.

$Y_9$, criminal victimization, measured by taking the absolute plus or minus change in the number of criminal offences known to the police from 1960 to 1970.2

$Y_{10}$, female family headship, measured by taking the absolute plus or minus change in the number of female headed families from 1960 to 1970, when families with female heads are presumed to be the difference between the total number of families and the total number of married couples.

2This dependent variable had to be dropped from the statistical analysis due to the unavailability of 1960 county crime statistics.
**Independent variable.** The independent variable is the extent to which each county has changed from a growth to a stationary population from 1960 to 1970. This was measured by taking the sum of the absolute deviations a county population pyramid has from the stationary population model pyramid. This measurement was taken using pyramids that were drawn from 1960 and 1970 census information. For comparative purposes, the counties were grouped as high positive change (stationary), moderate change (stable), and high negative change (growth) counties.

**Data analysis.** Correlation coefficients, specifically Pearson product moment correlations, were used to analyze the data in this portion of the study. Correlation coefficients, or r's, give a measure of association indicating the strength of the linear relationship between the two variables. If the value of r approaches +1.0 or -1.0, it can be assumed there is a strong linear relationship (Nie, et al., 1975:279). The sign associated with the r value denotes the direction of the relationship between the variables.

If the r is squared, the resultant statistic, $r^2$, can be used to interpret the strength, rather than the direction, of the relationship. $R^2$ is a measure of the proportion of variance in one variable "explained" by the other variable (Nie, et al., 1975:279).

Therefore, correlation coefficients can be used to determine the extent to which variation in one variable is linked to the variation in another variable. $R$ determines the direction of the relationship; $r^2$, the strength of the relationship.
Mathematically, $r$ is defined as the ratio of covariation to square root of the product of variation in $X$ and the variation in $Y$, where $X$ and $Y$ symbolize the two variables being analyzed. The formula used to compute this is:

$$
    r = \frac{\sum_{i=1}^{N} (X_i - \bar{X})(Y_i - \bar{Y})}{\left(\sqrt{\sum_{i=1}^{N} (X_i - \bar{X})^2 \sum_{i=1}^{N} (Y_i - \bar{Y})^2}\right)^{1/2}}
$$

where

- $X_i$ = ith observation of variable $X$,
- $Y_i$ = ith observation of variable $Y$,
- $N$ = number of observations,
- $\bar{X}$ = mean of variable $X$,
- $\bar{Y}$ = mean of variable $Y$ (Nie, et al., 1975:280).

A correlation coefficient was run for each dependent variable in association with the independent variable so that the amount of variation in each of the dependent variables explained by the change in the independent variable could be determined. Through the use of the $r$ and $r^2$ values, both the direction and the strength of the relationship of each of the dependent variables and the independent variable could be ascertained.

**Significance level.** The specified level of significance for this analysis was .05.
Null hypotheses. The null hypotheses were formulated as follows:

Changes from growth to stationary population will not be associated with:

1. Decreases in the number of births.
2. Decreases in the number of deaths.
3. Increases in the index of aging.
4. Decreases in the number of persons under age 20 and over age 64.
5. Increases in the ratio of men to women.
6. Increases in the number of women participating in the labor force.
7. Increases in the median income.
8. Decreases in the number of persons enrolled in elementary and secondary schools.
9. Increases in the number of female headed families.
CHAPTER V

ANALYSIS OF FINDINGS

Introduction

This chapter reports the findings for objectives one and two of this study. The chapter is divided into two parts, each dealing with one of the objectives.

Findings of Objective One

The first major objective of this study was to ascertain to what extent South Dakota is approaching zero population growth. Population pyramids depicting South Dakota population for 1960 and 1970, and the projected state population for 1980 and 1990, were prepared as shown in Figure 3 through Figure 6.

Certain assumptions underly the projected population figures used for 1980 and 1990. These population figures were taken from the South Dakota Planning Bureau's population projections, series B, prepared with the help of the Department of Rural Sociology (State Planning Bureau, 1978). The assumptions were as follows:

1. Mortality was assumed to continue at the estimated rate calculated for the age-sex cohorts in each component county during 1969, 1970, and 1971.

2. Fertility for each female cohort 15-44 was assumed to continue at the average rate estimated to prevail for 1974, 1975, and 1976 in each component county.
Figure 3. 1960 population by age and sex for South Dakota.
Figure 4. 1970 population by age and sex for South Dakota.
Figure 5. Projected 1980 population by age and sex for South Dakota.
Figure 6. Projected 1990 population by age and sex for South Dakota.
3. Migration was assumed to proceed at 20 percent of the halved 1960 to 1970 age-sex cohort rate, regardless of sign (State Planning Bureau, 1978:4).

Series B was selected over the two projections made by the Planning Bureau since it more clearly approximated the Federal-state cooperative estimates for 1975 (Bureau of the Census, 1975:7).

In comparing the population structures for the years 1960 to 1990, it can be noted that the 1960 pyramid is 'bottom heavy', with large proportions in the under 15 age cohorts. In 1970, there is a drop in the proportion in the 0-4 age cohort and an increase in the over 74 age cohorts. The 1980 age-sex structure is characterized by the movement of the large proportions of the 1960 population under age 15 into the 15-19 age cohorts. Also, in 1980, the proportion of people in the 0-4 age cohort is greater than in 1970. In 1990, the proportion of people in the age cohorts under 15 resembles that of 1960, although the cohorts are somewhat smaller. The bulge portraying the 15-29 age cohorts in 1980 is reflected in the 25-39 age cohorts in 1990.

The population age-sex structure in Figure 7 depicts the hypothetical stationary population model. Each of South Dakota's age-sex structures for the decades 1960 to 1990 were compared with this stationary population model and absolute deviations from this model were summed for each censal year (Figures 8 through 11). Although the population structures change in configuration between the decades 1960 to 1990, as noted earlier, the sum of the absolute deviations from the stationary population model does not change from 1960 to 1980, and the increase
Figure 7. Hypothetical age-sex structure for a stationary population.
Figure 8. 1960 population by age and sex for South Dakota and the stationary model, compared.
Figure 9. 1970 population by age and sex for South Dakota and the stationary model, compared.
Figure 10. Projected 1980 population by age and sex for South Dakota and the stationary model, compared.
Figure 11. Projected 1990 population by age and sex for South Dakota and the stationary model, compared.
from 1980 to 1990 is only one-tenth of one percent. The sum of the deviations for the years 1960, 1970, and 1980 was 27.7. The sum of the deviations for 1990 was 27.8. No great change toward a stationary population model is seen in the movement of South Dakota's population from 1960 to 1990.

Since there was little observed difference in the sum of the absolute deviations from the stationary population model in South Dakota's population and projected population between the decades 1960 and 1990, this researcher examined individual counties in South Dakota to determine whether this same pattern held for counties from 1960 to 1970. After calculating the change in the sum of absolute deviations from 1960 to 1970, the counties were separated into three groups. The first group consisted of those counties with high positive change, indicating a movement toward the stationary population model. These counties were termed stationary counties. The second group was made up of counties with moderate positive and negative change of ± 2.0 or less. These were termed stable counties since they did not show major movement in any specific direction. The third group included those counties which showed high negative change in their deviations from the stationary population model. These were termed growth counties.

Twenty seven counties in South Dakota were classified as stationary counties. The differences between the 1960 sum of absolute deviations and the 1970 sum of absolute deviations is shown in Table 2. These deviations ranged from 2.15 to 15.26 with a median of 3.72.
<table>
<thead>
<tr>
<th>County</th>
<th>1960 Deviations</th>
<th>1970 Deviations</th>
<th>Change*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stanley</td>
<td>47.93</td>
<td>32.67</td>
<td>15.26</td>
</tr>
<tr>
<td>Jackson</td>
<td>33.05</td>
<td>24.92</td>
<td>8.13</td>
</tr>
<tr>
<td>Charles Mix</td>
<td>34.19</td>
<td>26.99</td>
<td>7.20</td>
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<tr>
<td>Pennington</td>
<td>42.32</td>
<td>36.63</td>
<td>5.69</td>
</tr>
<tr>
<td>Codington</td>
<td>30.76</td>
<td>25.51</td>
<td>5.25</td>
</tr>
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<td>30.52</td>
<td>25.78</td>
<td>4.74</td>
</tr>
<tr>
<td>Hughes</td>
<td>36.03</td>
<td>31.31</td>
<td>4.72</td>
</tr>
<tr>
<td>Union</td>
<td>25.72</td>
<td>21.36</td>
<td>4.36</td>
</tr>
<tr>
<td>Beadle</td>
<td>27.85</td>
<td>23.73</td>
<td>4.12</td>
</tr>
<tr>
<td>Tripp</td>
<td>30.79</td>
<td>26.78</td>
<td>4.01</td>
</tr>
<tr>
<td>Butte</td>
<td>28.27</td>
<td>24.34</td>
<td>3.93</td>
</tr>
<tr>
<td>Walworth</td>
<td>29.90</td>
<td>26.02</td>
<td>3.88</td>
</tr>
<tr>
<td>Jones</td>
<td>32.90</td>
<td>29.11</td>
<td>3.79</td>
</tr>
<tr>
<td>Mellette</td>
<td>38.02</td>
<td>34.30</td>
<td>3.72</td>
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<tr>
<td>Hand</td>
<td>32.73</td>
<td>29.40</td>
<td>3.33</td>
</tr>
<tr>
<td>Perkins</td>
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<td>25.92</td>
<td>3.29</td>
</tr>
<tr>
<td>Fall River</td>
<td>28.98</td>
<td>25.83</td>
<td>3.14</td>
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<tr>
<td>Grant</td>
<td>27.94</td>
<td>24.84</td>
<td>3.09</td>
</tr>
<tr>
<td>Spink</td>
<td>22.91</td>
<td>19.85</td>
<td>3.06</td>
</tr>
<tr>
<td>Lyman</td>
<td>33.65</td>
<td>30.64</td>
<td>3.01</td>
</tr>
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<td>Gregory</td>
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<td>22.35</td>
<td>2.70</td>
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<td>Deuel</td>
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<td>24.14</td>
<td>2.70</td>
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<td>2.57</td>
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<tr>
<td>Campbell</td>
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<td>2.50</td>
</tr>
<tr>
<td>Moody</td>
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<td>31.20</td>
<td>2.35</td>
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<tr>
<td>Custer</td>
<td>24.75</td>
<td>22.43</td>
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<tr>
<td>McCook</td>
<td>29.51</td>
<td>27.36</td>
<td>2.15</td>
</tr>
</tbody>
</table>

*Rounding was done after subtracting.*
Table 3 lists the twenty four counties classified as stable counties. The sum of absolute deviations for this group ranged from -1.76 to 1.93. The median was 0.60.

The last group of counties, termed growth counties, included sixteen South Dakota counties. The range for this group was -2.38 to -18.13. The median was 5.15 (see Table 4).

Map 1 shows the stationary, stable, and growth counties for South Dakota 1960 to 1970.

Findings of Objective Two

Objective two of this study was to examine selected demographic and social consequences associated with zero population growth in a rural area like South Dakota.

Correlation coefficients were used to analyze the association between the independent variable and nine dependent variables. The nine dependent variables were:

1. Fertility.
3. Aging of the population.
4. Dependency.
5. Proportion of men to women.
6. Female participation in the labor force.
7. Income.
8. School enrollment.
9. Female family headship.
<table>
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<th>County</th>
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<th>Change*</th>
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<td>26.64</td>
<td>1.84</td>
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<td>24.87</td>
<td>1.81</td>
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<td>27.62</td>
<td>1.66</td>
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<tr>
<td>Corson</td>
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<td>41.60</td>
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<td>31.54</td>
<td>1.53</td>
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<td>Potter</td>
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<td>1.38</td>
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<td>28.31</td>
<td>1.22</td>
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<tr>
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<td>28.44</td>
<td>1.20</td>
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<tr>
<td>Day</td>
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<td>25.12</td>
<td>1.17</td>
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<td>Sully</td>
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<tr>
<td>Hyde</td>
<td>27.82</td>
<td>29.57</td>
<td>-1.76</td>
</tr>
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</table>

*Rounding was done after subtracting.
<table>
<thead>
<tr>
<th>Counties</th>
<th>1960 Deviations</th>
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<td>41.91</td>
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<td>Brookings</td>
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<td>Washabaugh</td>
<td>40.74</td>
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<td>-8.33</td>
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<td>Todd</td>
<td>43.61</td>
<td>51.84</td>
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<td>BonHomme</td>
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<td>Lake</td>
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<td>-2.61</td>
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<td>Turner</td>
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<tr>
<td>Hamlin</td>
<td>22.79</td>
<td>25.17</td>
<td>-2.38</td>
</tr>
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</table>

*Rounding was done after subtracting.
Table 5 reports the statistical findings. Three variables were found to be significantly associated with the change by county in the sum of absolute deviations from a stationary population model from 1960 to 1970: $Y_3$, aging of the population; $Y_4$, dependency; and $Y_8$, school enrollment. The independent variable was found to explain 18 percent of the variation in dependency, 15 percent of the variation in aging of the population, and 5 percent of the variation in school enrollment. Stated descriptively, the movement of South Dakota counties toward a stationary population model from 1960 to 1970 is associated with:

1. Decreases in the number of persons under age 20 and over age 64.
2. Increases in the index of aging.
3. Decreases in the number of persons enrolled in elementary and secondary schools.

Therefore, the following null hypotheses were rejected:

1. Changes from growth to stationary population will not be associated with decreases in the number of persons under age 20 and over age 64.
2. Changes from growth to stationary population will not be associated with increases in the index of aging.

---

$^3$Scattergrams were drawn for each independent-dependent variable relationship to verify that all relationships were linear rather than curvilinear. Correlation coefficients are based on the assumption that the relationship between the variables is linear.
<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>r</th>
<th>$r^2$</th>
<th>Significance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Y_4$</td>
<td>-0.44313</td>
<td>0.19637</td>
<td>0.00009</td>
</tr>
<tr>
<td>$Y_3$</td>
<td>0.39500</td>
<td>0.15602</td>
<td>0.00047</td>
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<tr>
<td>$Y_8$</td>
<td>-0.23022</td>
<td>0.05300</td>
<td>0.03045</td>
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<tr>
<td>$Y_1$</td>
<td>-0.15129</td>
<td>0.02289</td>
<td>0.11083</td>
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<td>$Y_6$</td>
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<td>$Y_7$</td>
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<td>$Y_9$</td>
<td>-0.00038</td>
<td>0.00000</td>
<td>0.49880</td>
</tr>
</tbody>
</table>
3. Changes from growth to stationary population will not be associated with decreases in the number of persons enrolled in elementary and secondary schools.

The remaining dependent variables, $Y_1, Y_2, Y_5, Y_6, Y_7,$ and $Y_9,$ were found not to be significantly associated with the independent variable. Therefore, the null hypotheses related to these dependent variables could not be rejected at the .05 level of significance.
CHAPTER VI

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

The purpose of this chapter is to review the research problem, objectives, and design; summarize major findings and conclusions related to the two objectives of the study; discuss implications derived from the research findings and conclusions; consider limitations of the study; and make recommendations for further research.

Summary of Research Problem, Objectives, and Design

Currently, six European counties have attained zero population growth and the United States is experiencing replacement level fertility. Consequently, concern with the possible attainment of zero population growth and its consequences has been a focus among demographers. Demographers believe that zero population growth will occur in the Midwest region before the nation as a whole. With governmental and social policy decision-making dependent upon future population size and composition, a study of the demographic and social consequences of zero population growth appeared appropriate.

The objectives of this study were to:

1. Determine to what extent South Dakota is approaching a zero population growth model.

2. Examine selected demographic and social consequences associated with zero population growth in a rural area like South Dakota.
Chapter II reviewed literature related to the problem. Major generalizations from the review indicate that the movement to zero population growth is associated with the following demographic conditions:

1. Continuing increase in size until a stationary model is finally attained.
2. An age structure that approaches a cylindrical shape, with greater proportions of elderly than are true currently.
3. Increasing proportions of men to women up to age 48, then a greater proportion of women to men.
4. Increasing numbers of divorces and more marriages among elderly men.
5. Stabilized mortality levels at their present low figures.
6. Fertility rates lowering to approximately two.
7. Decreasing amounts of international migration, with an average around 400,000 per year.
8. Internal migration in direction away from large metropolitan and remote rural areas and towards intermediate sized towns.

The literature review also revealed that the movement to zero population growth is associated with the following social conditions:

1. Slightly more incidences of "old age" diseases but, overall, a healthier elderly population than today.
2. Decreasing enrollment in elementary and secondary schools, coupled with an increase in the use of college education as a consumptive commodity for all ages.
3. Additional numbers of single women.
4. Increasing numbers of women employed in the labor force.
5. Decreases in the proportion of violent and property crimes.
6. Increasing numbers of elderly persons receiving public support payments.
7. Increasing numbers of child care facilities.
8. The delay in and diminishing opportunities for individual upward mobility.
9. Improvement of economic conditions.

Chapter III reported the theoretical orientation, suggesting that a population shift from a growth model to a stationary model produces changes in a number of social systems, including demographic, economic, social, and political structures. The theoretical framework hypothesized ten dependent variables to be associated with a shift toward a stationary population model in South Dakota.

Chapter IV described the methodology used in the study. Population structures for South Dakota in 1960 and 1970 and projected population structures for 1980 and 1990 were compared with the stationary population model. The sums of the absolute deviations from the stationary population model were calculated and analyzed.

Correlation coefficients were calculated and examined to determine factors that would be affected by the movement of South Dakota counties towards a stationary population model.
**Major Findings and Conclusions**

**Objective one.** Objective one was to ascertain the extent to which South Dakota is approaching zero population growth. South Dakota was found to have identical sums of deviations from the stationary population model for 1960, 1970, and 1980. This demonstrated that no movement towards a stationary population model occurred during these decades. The 1990 projected population for South Dakota deviated one tenth of a percentage point more than in the previous three decades, thus showing a slight trend away from the stationary population model.

Among the 67 counties of the State, between 1960 and 1970, 27 were found to be moving toward a stationary population model, 24 experienced relatively no movement, and 16 were found to be moving away from the stationary population model.

Therefore, it is concluded that South Dakota is not moving toward a stationary population model at the present time. However, from 1960 to 1970, some individual counties were moving toward stationariness, some were remaining stable, and some counties were growing. The counties appear to counteract one another. This may be a confounding pattern and account for why the State shows no movement towards a stationary population model.

One explanation for the absence of a pronounced State trend toward zero population growth is found in the fact that the "baby boom" cohorts of the 1950's are now moving into childbearing ages and producing an echoing increase in the younger cohorts in 1980. This is evidenced by comparing Figure 3 through Figure 6. The "baby boom
cohortsin 1960 are in the under 15 age groups. In 1970 they advanced into the 10-24 age cohorts and no echo is yet visible. However, in 1980, as the group moves into the 20-34 age cohorts, the proportion in the 0-4 cohort jumps dramatically when compared to 1970. The 1990 projected population shows an increase in the younger age cohorts as the "baby boom generation" continues to bear children. Even though this "baby boom generation" may limit average family size to replacement levels, their large numbers, which are out of proportion with the rest of the population, will cause the population to experience an echo effect in the next decades. This supports the generally accepted belief that the number of children born is directly related to the number of reproductive females in the population.

In examining the individual counties, there appears to be three explanations for some counties moving away from the stationary population model. The first group includes Brookings, Brown, Clay, Lake, and Yankton counties, which are locations for major colleges and universities. The deviations from the stationary population model appear associated with the high proportion of people in the 18-24 age group, the numbers of which increased from 1960 to 1970. The second group includes BonHomme, Hamlin, Hanson, Lawrence, Meade, and Turner counties, and are counties adjacent to major South Dakota cities. These counties have experienced growth from 1960 to 1970, apparently due to the selected migration of people out of the larger cities into smaller towns in neighboring counties. The third group of counties includes the Indian reservation counties of Bennett, Dewey, Shannon, Todd, and
Washabough. These counties have been experiencing continuing high fertility rates.

Therefore, it is concluded that counties with centers of higher education, adjacency to large cities, and Native American concentrations are not currently experiencing movement toward a stationary population.

**Objective two.** The second objective of the study was to determine the extent to which movement towards a stationary population model was associated with selected demographic and social factors.

At the .05 level of significance, three dependent variables were associated with the movement toward a stationary population.

Correlation coefficients showed that variation in the number of persons under age 20 and over age 64 is negatively related to the movement towards a stationary population model. Movement towards a stationary population model explained slightly more than 19 percent of the variation in the number of dependents.

Through the use of correlation coefficients, the aging of a population was found to be positively associated to the movement toward a stationary population model. This movement explained over 16 percent of the variation in the index of aging.

Correlation coefficients found the number of persons enrolled in elementary and secondary schools to be negatively associated to the movement toward the stationary population model. Five percent of the variation in school enrollments was explained by the movement toward the stationary population model.
It is concluded that a stationary population will result in smaller proportions of children under age 20, and larger proportions of senior citizens over age 64. This conclusion is supported by the fact that, although dependency is negatively correlated with a stationary population, the index of aging is correlated positively and school enrollment, negatively. However, the decreases among young dependents will more than offset the increases among older dependents. Consequently, there will be smaller proportions of total dependents in a stationary population.

**Implications of the Study**

This study showed that the state of South Dakota is not moving toward zero population growth. In fact, it appears that the State will not move towards zero population growth until the baby boom generation and their subsequent offspring have moved through the population structure. This implies that, contrary to recent speculation, South Dakota is not going to reach zero population growth in the immediate future. Consequently, policy decisions anticipating such a population shift need not be made on the state level at this time. However, county and city decision-making must evaluate the local trend of individual counties, since the movement to zero growth has been varying by county in South Dakota.

This study also found three variables associated with a move towards a stationary population model: dependency, aging of a population, and school enrollment. However, the amount of variation in
the dependent variables explained by the movement towards the stationary model is insufficient to warrant policy decisions to be made on the basis of these findings. Although the associations were statistically significant, the associations were not strong. Other causes for the observed changes in the dependent variables must be presumed to exist.

Overall, the findings imply that concern over the impending approach to zero population growth may be premature.

Limitations of the Study and Recommendations for Further Research

This study is limited by: 1. The time-span under study was for one decade only. Limiting the change variables of the counties to one decade may be obscuring the relationships among variables and the trends that might appear if a longer time-span were used. 2. The study operationalizes a multi-dimensional concept, zero population growth, through one measure, the sum of absolute deviations from the stationary population model. This oversimplification may be biasing the study's findings, in that some cohorts expand while others contract in proportion in any given time period. 3. This study did not control for any reciprocal relationships among the dependent and independent variables, relationships that are not accounted for in the theoretical model.

Further research needs to be done in this area. Such research should examine the consequences of zero population growth utilizing a longer time-span than used in this study. Improved measures of the
movement toward zero population growth should be developed and tested. Theoretically, a more complex model involving feedback mechanisms may allow for stronger associations than were found in this study. Also, more research needs to be done to substantiate the conjectures, currently discussed in the literature, relative to zero population growth and the social-demographic system.
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