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ABSTRACT

The current flux of conditions associated with the slow growth of enrollment admittedly makes projecting enrollment to the year 2000 highly speculative. The only way this process can be handled is by generating several conceptually meaningful series of enrollment projections. The three sets of enrollment projections in this report are based on assumptions about mortality, fertility, and migration. Although very different, each is conceptually useful. There is an attempt to analyze how enrollment rates have changed and to indicate the rationale for the projections. Demographic constraints to higher education are translated into economic constraints, and these are fitted into the projections. Finally, there are brief policy recommendations for types of support programs to aid the three out of four projected potential students who would normally and should be attending college over the next ten years, but will not without such programs. (JMF)

PROJECTIONS OF POPULATION AND COLLEGE ENROLLMENT IN MICHIGAN, 1970–2000

David Goldberg
and
Albert Anderson

Population Studies Center
University of Michigan

A Sponsored Research Project of
Governor's Commission on Higher Education
Lansing, Michigan
July, 1974

INTRODUCTION

Governor William G. Milliken appointed a Commission on Higher Education in January, 1973, to study the current conditions and future prospects of higher, or postsecondary, education in Michigan. In attempting to forecast the needs of postsecondary education in the decades ahead, one of the most essential ingredients is a projection of college enrollments. The Commission reviewed previous studies in Michigan, studies done for other states, and national forecasts (principally the work of the Carnegie Commission on Higher Education). None seemed current enough or specific enough to the Commission's task. Therefore, the Commission turned to Dr. David Goldberg and his associates at the Population Studies Center of the University of Michigan for a study of population and college enrollment projections extending to the year 2000. Dr. Goldberg's college enrollment studies in the 1960s were most useful in earlier planning studies of higher education in Michigan.

In sponsoring this research project, the Commission does not necessarily endorse all of the findings and conclusions. The responsibility, and credit, remain solely with the authors. But the Commission does believe that this study is so significant that it should be brought to the attention of the postsecondary education community and other research and policy groups. Therefore, the report has been reproduced and distributed. It is hoped that this report will be as helpful to others as it has been to the Commission.

Governor's Commission on Higher Education
Lansing, Michigan
July, 1974

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Projections of Population and College Enrollment in Michigan, 1970-2000

Prepared for
The Governor's Commission on Higher Education

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(Presented to the Commission fall, 1973.
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Summary of the College Enrollment Projections

The late 1960's marked the end of a period of almost uninterrupted growth of college enrollment rates. Changes in rates and population had produced massive increases in college enrollment. The peak proportion of high school graduates who enrolled in college occurred in 1968. It has declined each year since then. The proportion of males age 18-21 enrolled in college has declined considerably since the highs achieved in 1969. Enrollment rates for older age groups and for females have continued to increase or have remained stable. Several factors may be hypothesized as associated with the decline or slow growth of enrollment at a time when the prime college age group is growing at a rapid rate:

1. Changes in the draft laws
2. Relative economic difficulties of young adult males: a. the ratio of males age 20-24 to males age 25-34 or 25-44 (their potential competitors) is exceptionally high, b. unemployment rates are surprisingly high among recent college graduates
3. The incidence of sibling pairs of college age is increasing very rapidly at this point in time and will continue to increase until 1980. In short this implies enormous economic burdens for families who wish to send their children to college.

The current flux of conditions makes the whole process of projection highly speculative and subject to enormous error. In the past, enrollment rates increased almost linearly, making enrollment projections subject primarily to errors of population projection. Today we are witnessing major changes in enrollment rates and none of us can be certain whether

we are looking at the tip of the iceberg or the whole thing. Simultaneously, women's roles and fertility are changing, each having implications for enrollment in the future. The only way this can be handled is by generating several conceptually meaningful series of enrollment projections, three of which are contained in the tables.

The three enrollment projections are linked to one set of population projections based on the following assumptions:

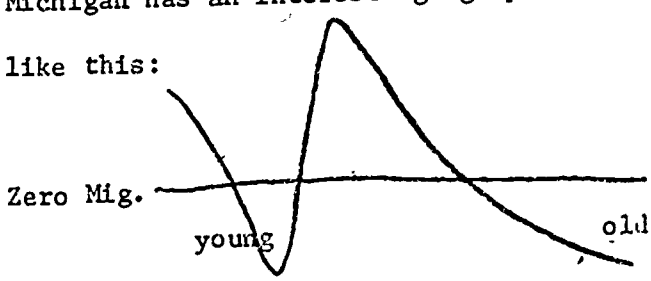
Mortality: The choice of models makes little difference. In fact, immortality wouldn't drastically change the projections. About 96% of the population survives to age 30. We have used differing mortality assumptions for the 1970's, 1980's, and 1990's which imply modest increases in expectation of life at birth.

Fertility: In briefest terms, the fertility projections imply that women will behave in very different ways from one period to another. In the period 1970-75 women have children at a rate consistent with 2.03 children per woman. For successive five year periods the rates are 1.95, 2.25, 2.60, 2.50, and 2.40. Only the first three are relevant for the enrollment projections to 2000. The pattern may strike the reader as peculiar, but we have based it on two series that we consider to be important determinants: 1. the relative economic circumstances of young men in future years as determined by the ratio of their numbers to the numbers of men in age groups immediately above them. 2. the ratio of males age X + 2 or 3 years to females age X. This tells us something about future marriage patterns. The situation for young people in the 80's will be very different from the situation they are experiencing in the 70's. Young men (say 20-24) will continue to experience economic difficulties in the 1970's

to the extent that the relative size of their cohort is a determinant of their circumstances. This will change very sharply in the 1980's as a result of the decline in fertility over the past several years. Young women are currently caught in a marriage squeeze. In 1970 there were 80 men age 21-24 per 100 women age 18-21. By 1980, the ratio returns to a more normal 99 and by 1985 it is a 'favorable' 106. The period fertility assumptions, together with the fertility accrued by 1970, produce a declining number of children per woman from 3.3 among those age 35-39 in 1970 to 2.1 among those age 15-19 and then back up to about 2.4 children among those age 5-9 in 1970 and subsequent cohorts of women.

Migration: All economic forecasts of future industry growth imply that the mix of industries for Michigan should grow at about the national growth levels. Translated to migration this should mean relatively little net migration for the state. During the past three decades, Michigan has gained a net of 339,000, 166,000, and 27,000 migrants. Through the use of Census documents published in the past few months and the analysis of a census tape, a set of age specific migration rates was developed for 1970-75 and all subsequent 5 year periods. The net migration projected for the state is 44,000 in 1970-75, with numbers ranging between 11,000 and 28,000 for subsequent five year periods. The reason for the decline between 1970-75 and subsequent periods is based on the assumption of a net gain to Michigan from declines in the armed forces 1970-75.

Michigan has an interesting age pattern of migration that looks something like this:



The state seems to attract young persons and their dependent children. By about age 40-44 the state has a net loss of population. There is a fairly heavy loss of population in the age range 15-24, probably associated with the completion of high school and college.

The effects of all population assumptions for the prime college ages are given below:

	Population (000's)						
Age	1970	75	80	85	90	95	2000
18-21	618	746	760	682	646	602	750
18-24	1032	1247	1336	1238	1122	1063	1226

	% Change					
	1970-75	75-80	80-85	85-90	90-95	1995-2000
18-21	+21%	+2%	-10%	-5%	-7%	+25%
18-24	+21%	+7%	-7%	-9%	-5%	+15%

The swings are very dramatic and should make it clear that planning for higher education will require considerable adjustment and imagination.

Enrollment Rates and Enrollment: The basic procedure followed here was to project national age specific enrollment rates based on the civilian non-institutional population and convert these projected rates to a set of enrollment rates for Michigan that were consistent with the opening fall enrollment figures for degree-credit students. National time series of age specific enrollment rates are civilian based and obtained in October. Michigan age specific enrollment rates are based on total population, obtained in April, and available only at ten year intervals. A careful examination of the enrollment rates for Michigan, used in this report, will show that they are lower than the national figures. This derives

from our use of a total population base for Michigan. The Census Bureau always uses the civilian noninstitutional population in its Current Population Reports. The Bureau figures on college enrollment are based on individual answers to questions about enrollment, not on institutional figures as used in the Opening Fall Enrollment Statistics. The Census series is roughly comparable to the Degree Credit Enrollment Series. You should anticipate the greatest discrepancies between national figures and Michigan figures to occur at the youngest ages where an April or October reading makes a significant difference as does the difference between civilian and total population.

It seems that there are two fundamental problems with the work of Carnegie Commission:

1. Their projections are a simple extrapolation of trends over the past 20 years, resulting in a projected degree-credit enrollment rate up to 54% for the population age 18-21. This figure may be a total impossibility if one uses as a frame of reference anything resembling the term college. It is impossible because it implies substantial degree credit enrollment of population with IQ's in the range 80-90. It appears unlikely because it implies that about two-thirds of all high school graduates want to go to college and can go to college. There is no evidence to suggest that will be the case in the future.
2. The suggestion that enrollment fees should be increased substantially creates an impossible set of economic constraints for families with two or more children who will simultaneously

be of college age. This phenomenon is on the increase now and will continue to increase to about 1980. The high fertility in the 20 years following the close of World War II and the compression of birth spacing has produced a phenomenal increase in closely spaced pairs of sibs. We are convinced this problem is closely tied to the recent decline in enrollment rates of young persons.

There are three sets of enrollment projections contained in the tables. They are very different from one another, but are not an attempt to hedge a bet. Each series is conceptually useful.

Model 1 simply takes the 1970 enrollment rates and holds them constant throughout the projection period. This should always be included in a set of projections because it allows the consumer to evaluate potential changes in enrollment based entirely on population change.

Model 2 is keyed primarily to the potential economic problem resulting from changes in the number of sibs of college age. It also represents an attempt to "fit" the data to some preliminary 1973 estimates of 424,000 total enrollment in the state. In this sense, it should be the most accurate in the short run. Substantively, it assumes major declines in enrollment rates for young males between 1970 and 1980. Smaller declines are projected for young females. By 1985, the sib problem is over and enrollment for young adults returns to the 1970 levels. Enrollment rates are projected upward to 1990. Rates for all "older" persons are assumed to increase between 1970 and 1990.

Between 1990 and 2000 the rates are held constant, not because that will be the case, but because: 1. We have not attempted to link the stbship problem to future fertility, 2. you should be using newer projections based on newer data when those figures are critical for decision making, and 3. by freezing the rates for the last decade, the projections offer advantages similar to Model 1 at a higher level.

Model 3 is taken from the Census Bureau Series 1 projections and applied to the Michigan population. This is essentially the same model used by Carnegie. Thus you have the most prestigious and widely read projections applied to your own state for purposes of evaluation and policy making. This model is a simple mechanical extrapolation of changes in enrollment rates between 1950 and 1970 carried through to 2000.

The projections of enrollment are made for age-sex groups for each point in time. A consumer has the opportunity to "glue together" a set of assumptions to produce his own model. For example, if Model 2 is considered too conservative for the older age groups (and it may be), one could append the older age groups from Model 3 to the younger age groups of Model 2. In comparing the models, the reader should probably focus on differences in 1975 (because it is almost now) and 1990 (because that is where Model 2 essentially stops).

If one's objective is to provide college facilities for anyone who wants and is capable of using them, a prerequisite is to provide the facilities where the population is located. California and Michigan has a terrible distribution of facilities in relation to population

(the last table provides this information). This can only serve to magnify the problem being created by siblings whose ages are similar.

An alternative loan scheme modeled after a home mortgage is developed in the last section.

Note. The tables are ordered by topics--Mortality, Fertility, Migration, Population, Enrollment. They are provided at this point in the text for readers primarily interested in the projected numbers. The rationale for some of the projection details follows the tables.

Table 1

Five Year Survival Rates by Sex
for Each Projection Period[a]

Age	1970-75 1975-80		1980-85 1985-90		1990-95 1995-2000	
	Male	Female	Male	Female	Male	Female
Birth to 0 - 4	.979	.983	.980	.984	.982	.986
0 - 4 to 5 - 9	.997	.997	.997	.998	.997	.998
5 - 9 to 10 - 14	.998	.999	.998	.999	.998	.999
10 - 14 to 15 - 19	.995	.998	.996	.998	.996	.998
15 - 19 to 20 - 24	.991	.997	.992	.997	.992	.997
20 - 24 to 25 - 29	.990	.996	.991	.996	.992	.997
25 - 29 to 30 - 34	.990	.995	.991	.995	.992	.995
30 - 34 to 35 - 39	.988	.993	.989	.993	.989	.994
35 - 39 to 40 - 44	.982	.989	.983	.990	.984	.990
40 - 44 to 45 - 49	.972	.984	.973	.985	.975	.986
45 - 49 to 50 - 54	.956	.976	.957	.977	.959	.978
50 - 54 to 55 - 59	.933	.966	.934	.967	.937	.968
55 - 59 to 60 - 64	.897	.949	.900	.951	.906	.952
60 - 64 to 65 - 69	.849	.924	.854	.924	.861	.926
65+ to 70+	.670	.744	.674	.736	.675	.727

a. Source: Current Population Reports, "Projections of the Population of the United States by Age and Sex: 1972 to 2020," Series P-25, No. 493, Decem[illegible]r 1972.

Table 2

Projected Births per 1000 Women in Michigan
for the Periods 1970-75, ... 1995-2000

Age	Births per 1000 Women for: 1970-75	1975-80	1980-85	1985-90	1990-95	1995-00
10 - 14 to 15 - 19	65	60	80	100	100	90
15 - 19 to 20 - 24	570	550	630	750	720	690
20 - 24 to 25 - 29	770	740	850	940	910	880
25 - 29 to 30 - 34	425	410	480	570	550	530
30 - 34 to 35 - 39	150	140	160	180	170	160
35 - 39 to 40 - 44	40	40	40	40	40	40
40 - 44 to 45 - 49	10	10	10	10	10	10
Total	2030	1950	2250	2600	2500	2400

Table 3

Actual and Projected Number of Children by Age per 1000 Women in Michigan

Age in 1970 or Birth Cohort	Children Ever Born by Age								Total
	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	
.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.
1981-85	-	90	780	1660	2190	2350	2390	2400	2400
1976-80	-	100	790	1670	2200	2360	2400	2410	2410
1971-75	-	100	850	1700	2230	2390	2430	2440	2440
0- 4	-	80	830	1740	2270	2430	2470	2480	2480
5- 9	-	60	690	1630	2180	2340	2380	2390	2390
10-14	-	65*	615	1465	2035	2205	2245	2255	2255
15-19		71	641	1381	1861	2041	2081	2091	2091
20-24			723	1493	1903	2063	2103	2113	2113
25-29				1857	2282	2422	2462	2472	2472
30-34					2818	2968	3008	3018	3018
35-39						3240	3280	3290	3290
40-44							3157	3167	3167
45-49								2882	2882
50-54									2612
55-59									2392
60-64									2323
65+									2631

*Figures below lines are actual number of children per 1000 women reported in the 1970 Census. Those above the lines are projected cumulative fertility.

Table 4

Projections of Births and Population Age 0-4

1970-2000

Age	Female Population in: 1970-1975	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000	Births per 1000 Women for: 1970-1975	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000
10-14 to 15-19	4806[a]	4544	4023	3762	4160	5133	65	60	80	100	100	90
15-19 to 20-24	4382	4825	4560	4037	3776	4175	570	550	630	750	720	690
20-24 to 25-29	3806	4462	4910	4641	4110	3844	770	740	850	940	910	880
25-29 to 30-34	3024	3896	4548	5006	4732	4192	425	410	480	570	550	530
30-34 to 35-39	2494	3044	3916	4573	5032	4758	150	140	160	180	170	160
35-39 to 40-44	2425	2484	3029	3896	4552	5008	40	40	40	40	40	40
40-44 to 45-49	2664	2390	2448	2986	3844	4492	10	10	10	10	10	10

Projected Total Births for:

1970-75	1975-80	1980-85	1985-90	1990-95	1995-00
7524	8375	10323	11629	10553	9954

Projected Male Births for:

1970-75	1975-80	1980-85	1985-90	1990-95	1995-00
3852	4288	5286	5954	5403	5096

Projected Female Births for:

1970-75	1975-80	1980-85	1985-90	1990-95	1995-00
3672	4087	5037	5675	5150	4858

Surviving Male Population Age 0-4 in:

1975	1980	1985	1990	1995	2000
3771	4198	5180	5835	5306	5004

Surviving Female Population Age 0-4 in:

1975	1980	1985	1990	1995	2000
3610	4018	4956	5584	5078	4790

a. Figures for population and births reported in hundreds.

Table 5

Net Migration and Migration Rates for Five Year Periods by Sex by Age Used in the Population Projections for Michigan, 1965-2000

Males

Age	Net Migrants[a]							Rates[b]		
	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95	1995-00	1965-70	1970-75	1975-80 and on
15-19	-4	-5	-6	-5	-5	-5	-6	-.008	-.010	-.012
20-24	-7	-9	-12	-12	-10	-10	-11	-.016	-.020	-.025
25-29	23	23	17	19	18	16	15	.081	.070	.040
30-34	10	10	9	11	12	12	10	.042	.035	.025
35-39	4	4	3	4	4	5	5	.019	.017	.010
40-44	2	2	1	1	1	1	1	.008	.007	.002
45-49	1	-1	-1	-1	-1	-1	-2	.004	-.002	-.004

Females

Age	Net Migrants							Rates		
	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95	1995-00	1965-70	1970-75	1975-80 and on
15-19	5	1	1	1	1	1	1	.011	.003	.002
20-24	7	5	5	5	4	4	4	.020	.012	.010
25-29	13	15	14	16	15	13	12	.043	.040	.032
30-34	6	6	6	7	8	8	7	.025	.020	.016
35-39	3	2	2	2	3	3	3	.013	.008	.006
40-44	2	1	0	0	0	1	1	.009	.002	.001
45-49	0	-1	-1	-1	-1	-2	-2	-.000	-.003	-.004

a. All figures in thousands.

b. Net migrants age X at end of period divided by population age X-5 at beginning of period.

Table 6

Projected Population of Michigan by Sex
for Selected Age Groups

1970-2000

	Males						
Age	1970	1975	1980	1985	1990	1995	2000
15-17	2764[a]	2985	2741	2444	2247	2698	3277
18-19	1601	1928	1906	1669	1616	1569	1992
20-21	1304	1811	1887	1725	1611	1436	1756
22-24	1984	2427	2859	2769	2366	2299	2370
25-29	2935	3485	4365	4893	4633	4104	3854
30-34	2394	3009	3537	4435	4971	4712	4174
35-39	2304	2406	3003	3533	4430	4966	4707
40-44	2594	2279	2368	2958	3450	4368	4897
45-49	2578	2516	2206	2295	2866	3351	4242

	Females						
Age	1970	1975	1980	1985	1990	1995	2000
15-17	2675	2905	2675	2379	2182	2621	3183
18-19	1687	1903	1869	1644	1580	1539	1951
20-21	1588	1818	1939	1778	1657	1474	1797
22-24	2151	2583	2903	2797	2394	2315	2393
25-29	3001	3874	4524	4978	4707	4169	3899
30-34	2493	3046	3917	4573	5033	4758	4215
35-39	2436	2496	3043	3914	4573	5030	4758
40-44	2689	2414	2471	3015	3879	4532	4985
45-49	2714	2638	2365	2424	2958	3809	4451

a. All population figures in hundreds.

Table 7

College Enrollment and Enrollment Rates by Sex for Selected Age Groups: Michigan, U.S.A., 1960-1970[a]

Males

Age	Michigan Population (000's) 1960	1970	Michigan Coll. Enr. (000's) 1960	1970	Michigan % Enrolled 1960	1970	U. S. A. Population (000's) 1960	1970	U. S. A. Coll. Enr. (000's) 1960	1970	U. S. A. % Enrolled 1960	1970
15-17	186	276	1	1	0.5	0.3	4320	5978	30	26	0.7	0.4
18-19	92	160	22	54	23.7	33.6	2338	3656	510	1169	21.8	32.0
20-21	83	130	20	49	24.1	37.2	2128	3266	446	1079	20.9	33.0
22-24	127	198	18	41	14.1	20.6	3108	4651	375	885	12.1	19.0
25-29	231	294	17	32	7.5	10.8	5299	6622	366	669	6.9	10.1
30-34	267	239	7	13	2.7	5.3	5806	5596	151	286	2.6	5.1
35-49		748		13[b,c]		1.7[b,c]		17116		178[d]		1.0[d]

Females

Age	Michigan Population (000's) 1960	1970	Michigan Coll. Enr. (000's) 1960	1970	Michigan % Enrolled 1960	1970	U. S. A. Population (000's) 1960	1970	U. S. A. Coll. Enr. (000's) 1960	1970	U. S. A. % Enrolled 1960	1970
15-17	182	267	1	1	0.6	0.3	4151	5766	34	31	0.8	0.5
18-19	105	169	20	48	19.1	28.3	2407	3671	468	1091	19.4	29.7
20-21	97	159	13	39	13.6	24.5	2234	3552	295	862	13.2	24.3
22-24	144	215	6	20	3.9	9.5	3258	4901	113	439	3.5	9.0
25-29	245	300	4	13	1.8	4.5	5506	6855	83	266	1.5	3.9
30-34	273	249	3	8	1.0	3.1	6078	5835	61	164	1.0	2.8
35-49		784		10[b,c]		1.3[b,c]		18116		183[d]		1.0[d]

[a] Based on total resident population enumerated in April (Decennial Census)

[b] Based on estimates made from Michigan residents in the Census Public Use Sample One in One Thousand Tape.

[c] The estimates for Michigan represent enrollment at all ages 35 and over to Population age 35-49. About 4/5ths of the college enrollment of older persons is concentrated in the age range 35-49.

[d] U.S. Bureau of the Census, Subject Reports, School Enrollment.

Table 8

Fall Enrollment in Institutions of Higher Education - Michigan and the U.S.A., 1960-1972

	Michigan			U.S.A.			
	Degree Credit Enrollment	Other	Total	Degree Credit Enrollment	Other	Total	C.P.S. College Enrollment 14-34
1960	160*			3583	206	3789	3570
1961	170			3860	186	4046	3731
1962	183			4175	229	4404	4208
1963	195			4495	271	4766	4336
1964	220			4950	330	5280	4643
1965	252	19	271	5526	394	5920	5675
1966	266	30	296	5928	462	6390	6085
1967	284	33	317	6406	505	6911	6401
1968	306	37	343	6928	585	7513	6801
1969	328	39	367	7484	610	8094	7435
1970	342	51	393	7920	661	8581	7413
1971	357	49	406	8116	833	8949	8087
1972	344			8220	904	9124	8313

* All figures in thousands.

Sources: U.S. Department of Health, Education, and Welfare. "Opening Fall Enrollment in Higher Education."

U.S. Department of Health, Education, and Welfare. "Digest of Educational Statistics, 1972."

Table 9

College Enrollment Rates by Age: U. S. Males, 1946-1972
(Resident Civilian Non-Institutional Population, October)

	Percent Enrolled in College							
	14-17	16-17	18-19	20-24	20-21	22-24	25-29	30-34
1946	1.1	a	14.5	15.6			3.7	
1948	1.6		22.6	15.4			4.7	1.4
1950	1.8		20.7	13.5			5.6	
1952	1.5		20.9	16.1			4.6	1.3
1954	1.6		24.1	17.9			6.4	1.8
1956	1.6		28.6	19.4			8.2	2.3
1958	1.4		32.8	19.5			8.6	2.6
1960	1.7	3.5	33.0	19.4	26.3	14.7	8.0	3.5
1962	1.9	4.4	37.7	22.4	29.4	17.4	8.2	3.7
1963	1.5	3.0	34.4	24.5	31.7	19.0	7.4	3.4
1964	2.3	4.7	35.6	22.9	32.7	15.7	7.8	3.6
1965	1.6	3.2	40.1	26.6	36.0	20.5	8.9	4.2
1966	1.5	3.0	42.5	28.4	39.9	20.9	9.4	3.5
1967	1.3	2.7	41.2	29.3	42.5	20.0	9.3	4.7
1968	1.8	3.7	43.3	29.3	43.6	19.4	10.2	4.6
1969	1.5	3.2	44.0	30.8	44.7	22.1	10.9	5.1
1970	1.6	3.4	40.2	28.2	40.9	20.6	10.6	4.8
1971	1.6	3.2	41.2	28.4	37.8	22.6	11.6	6.0
1972	1.7	3.4	37.6	26.8	36.0	20.7	12.0	5.7
1973	1.4	2.9	34.8	24.6	33.6	18.6	11.6	5.3

[a]Data for vacant cells in the table not reported in the Current Population Survey, School Enrollment of the Civilian Population: October 1946, 1948, ...1972.

Table 10

College Enrollment Rates by Age: U. S. Females, 1946-1972
(Resident Civilian Non-Institutional Population, October)

	Percent Enrolled in College							
	14-17	16-17	18-19	20-24	20-21	22-24	25-29	30-34
1946	2.3	a	10.8	3.2			0.4	
1948	2.0		12.3	3.2			0.4	0.3
1950	2.6		15.9	4.3			0.2	
1952	1.8		14.7	4.4			0.5	0.5
1954	1.7		15.4	5.5			1.4	1.0
1956	1.9		19.3	6.1			1.1	0.8
1958	1.8		21.8	6.9			1.7	1.0
1960	2.2	4.4	22.5	6.9	12.5	2.9	1.7	1.1
1962	1.7	3.9	26.1	8.3	14.8	3.5	1.5	1.0
1963	1.2	2.5	26.0	9.8	17.3	4.0	2.1	1.2
1964	1.8	3.6	26.4	10.3	18.4	4.3	2.2	1.3
1965	2.2	4.4	30.3	11.2	18.9	6.0	2.7	1.9
1966	2.1	4.3	30.7	11.8	19.9	6.3	3.2	1.5
1967	2.0	4.1	31.5	13.6	22.6	6.6	2.9	2.1
1968	2.0	4.1	33.1	13.5	20.6	7.6	2.9	2.5
1969	1.6	3.3	34.4	15.2	24.0	8.7	3.6	3.0
1970	1.7	3.4	34.6	14.3	22.3	8.9	3.7	2.6
1971	1.9	3.9	34.4	15.0	25.7	7.9	3.9	3.2
1972	1.9	3.8	34.3	15.6	25.6	8.7	5.0	3.2
1973	2.1	4.1	31.2	16.0	25.1	9.7	5.2	3.3

[a]Data for vacant cells in the table not reported in the Current Population Survey, School Enrollment of the Civilian Population: October 1946, 1948, ...,1972.

Figure 1

Male Enrollment Rates for the Civilian Non-Institutional Population of the U. S. 1965-1973

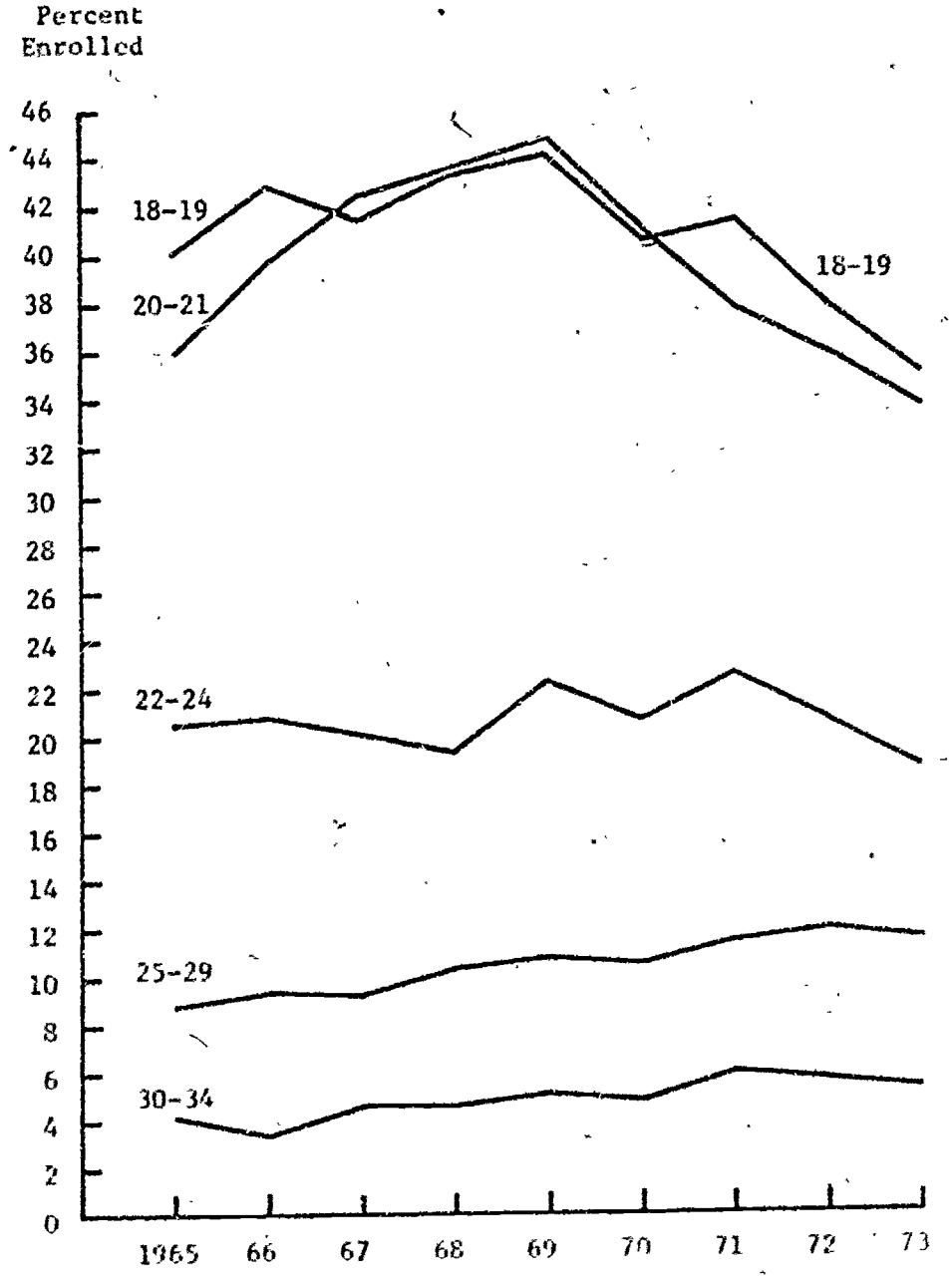


Figure 2

Female Enrollment Rates for the Civilian Non-Institutional Population of the U. S. 1965-1973

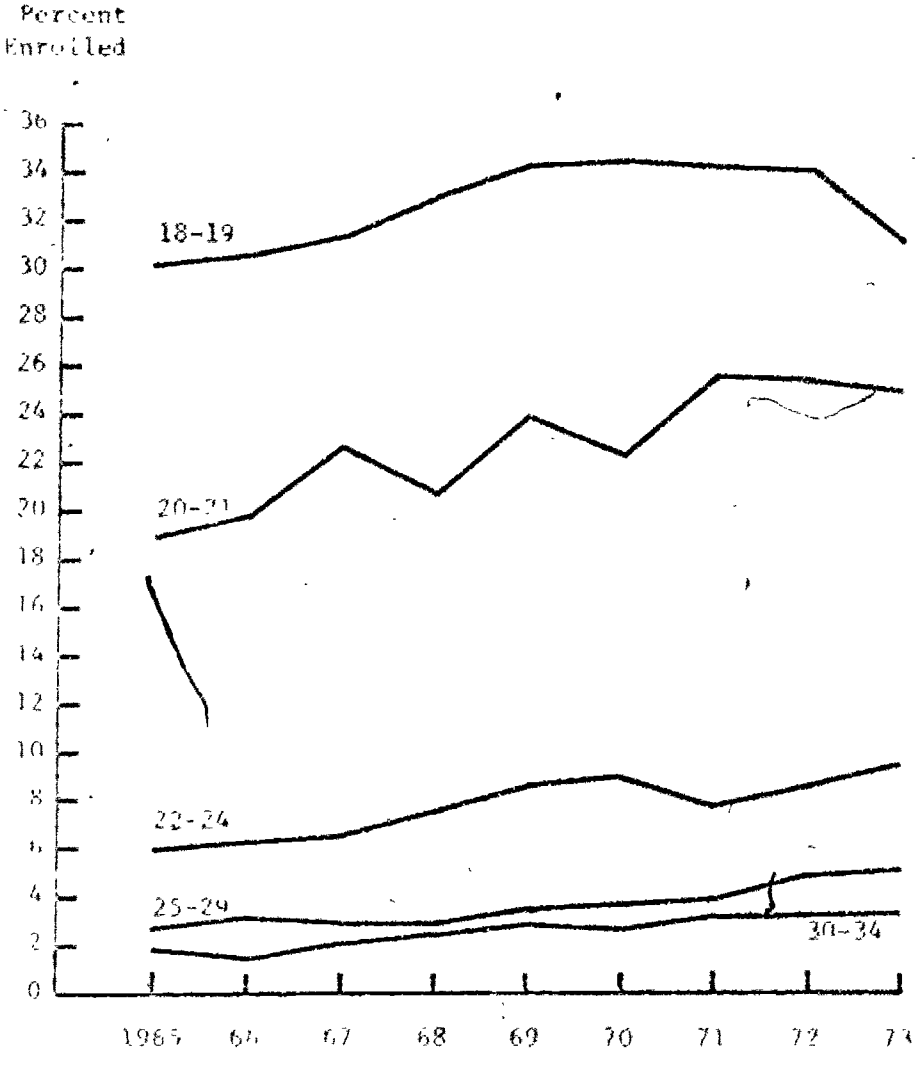


Table 11

Selected Data on Sibling Pairs for Michigan[a]

Age X			Potentially Entering College in Year	No. of Families Having Children of This Age Living in the Household (000's)		% of Families* Containing Pair of Sibs at Age X and One Year Older Than Age X		% of Families Containing Pair of Sibs at Age X and X + 2	
Age in 1970	Age in 1960	Born in Year		1970	1960	1970	1960	1970	1960
0		1970	1988	153		14.0		19.6	
1		1969	1987	155		12.8		20.0	
2		1968	1986	148		14.1		20.3	
3		1967	1985	153		13.9		19.1	
4		1966	1984	162		16.7		21.5	
5		1965	1983	172		18.8		25.3	
6		1964	1982	174		21.4		25.6	
7		1963	1981	186		21.0		26.7	
8		1962	1980	182		22.8		26.6	
9		1961	1979	189		20.7		29.2	
10	0	1960	1978	190	180	22.6	21.5	26.6	26.8
11	1	1959	1977	193	190	20.5	23.1	28.2	29.3
12	2	1958	1976	188	186	20.8	21.8	26.7	26.8
13	3	1957	1975	191	189	23.1	20.4	27.2	26.4
14	4	1956	1974	187	185	19.7	19.8	24.2	24.7
15	5	1955	1973	180	179	17.8	21.0	23.4**	23.5
16	6	1954	1972	171	177	17.0**	17.3	--	24.6
	7	1953	1971		167		16.8		23.0
	8	1952	1970		166		16.9		23.5
	9	1951	1969		156		17.9		22.5
	10	1950	1968		153		17.9		21.6
	11	1949	1967		153		16.1		21.3
	12	1948	1966		153		11.9		13.9
	13	1947	1965		141		9.4		18.3
	14	1946	1964		111		11.4		16.5
	15	1945	1963		115		11.5		18.2**
	16	1944	1962		114		9.8**		--

[a]Data for this table and Tables 11A-11O obtained from the one in one hundred Public Use Sample Census Bureau tapes of 1960 and 1970.

*Between one and two percent of all families have a pair of sibs both of whom are age X. These sets of twins and closely spaced children are included.

**Above 90-91% of the 17 year olds in the state live in families and are identified as children by the Census. Comparable figures for other ages are 0-10(99+), 15(9[illegible]6%), 16(94?), 18(69-70%). Therefore, sibship rates involving 17 year olds are slight underestimates.

--Excluded from the analysis because of the high proportion of persons age 18 or more who do not live as children in families.

Table 11A

Ratio of Older Sibs of "College Age" to Families Containing Children of Age X

Age X			Potentially Entering College in Year	Where "College Age" is:[a]					
				X + 0 to X + 2		X + 0 to X + 3		X + 0 to X + 4	
Age in 1970	Age in 1960	Born in Year		1970	1960	1970	1960	1970	1960
0		1970	1988	.336		.514		.658	
1		1969	1987	.328		.514		.663	
2		1968	1986	.344		.530		.691	
3		1967	1985	.339		.503		.661	
4		1966	1984	.382		.591		.755	
5		1965	1983	.440		.644		.842	
6		1964	1982	.470		.698		.910	
7		1963	1981	.477		.697		.883	
8		1962	1980	.494		.743		.953	
9		1961	1979	.499		.730		.931	
10	0	1960	1978	.492	.483	.726	.722	.947	.931
11	1	1959	1977	.487	.524	.717	.771	.914	.980
12	2	1958	1976	.475	.486	.688	.728	.874	.932
13	3	1957	1975	.503	.468	.737	.696	.899*	.882
14	4	1956	1974	.439	.443	.646*	.651	—	.844
15	5	1955	1973	.392*	.445	—	.662	—	.837
	6	1954	1972		.419		.624		.788
	7	1953	1971		.398		.591		.785
	8	1952	1970		.404		.598		.755
	9	1951	1969		.404		.600		.759
	10	1950	1968		.395		.564		.664
	11	1949	1967		.374		.514		.632
	12	1948	1966		.258		.400		.537
	13	1947	1965		.257		.409		.533*
	14	1946	1964	—	.279		.461*		—
	15	1945	1963		.297*		—		—

[a] ...ually a family having two children age X and X + 3, say 18 and 21, potentially has two children in college at the same time for a one year overlap when one is a freshman, one a senior. Several conditions, the most important being month of birth, can result in a grade difference of Y - 1, Y, or Y + 1 when the age difference in sibs is Y. Therefore, ratios are given for 2, 3, and 4 year differences in Table 11A.

...bship ratios that include 17 year olds are slight underestimates because only ...% of the 17 year olds are enumerated as children living in families, compared ... 94-98% for younger ages.

...cluded from the analysis because of the high proportion of persons age 18 or ...re who do not live as children in families.

Table 11B

Average Number of Sib Years* of College Age for Children Potentially Entering College Between 1965 and 1985 by Year in College

Age X		Potentially entering college in year	Number of children of this age living in households (000's)	Average Sib Years of College Age							
Age in 1970	Age in 1960			Total		Freshman		Sophomore		Junior		Senior	
3		1985	155	1.95		.51		.45		.47		.52	
4		1984	164	2.10		.60		.51		.48		.51	
5		1983	175	2.25		.65		.59		.51		.50	
6		1982	177	2.48		.70		.64		.59		.54	
7		1981	189	2.62		.70		.67		.63		.62	
8		1980	187	2.78		.75		.70		.68		.66	
9		1979	193	2.81		.74		.70		.67		.70	
10		1978	195	2.79		.73		.69		.68		.69	
11		1977	196	2.84		.72		.69		.69		.74	
12		1976	192	2.77		.69		.68		.68		.72	
13	3	1975	194	193	2.87	2.82	.74	.70	.69	.67	.71	.70	.73	.75
	4	1974		189		2.69		.66		.64		.66		.73
	5	1973		183		2.72		.67		.64		.68		.74
	6	1972		181		2.60		.63		.62		.63		.72
	7	1971		169		2.41		.60		.56		.59		.66
	8	1970		168		2.43		.61		.56		.59		.67
	9	1969		160		2.46		.61		.58		.60		.68
	10	1968		157		2.40		.58		.56		.60		.66
	11	1967		155		2.22		.52		.53		.55		.61
	12	1966		155		1.88		.41		.41		.49		.58
	13	1965		144		1.82		.42		.39		.45		.56

*A sib year is defined as the number of years a child of age X has sibs who will be 18-21 years old while the child of age X will be 18-21 years old. For example, suppose a child of age 8 has two sibs age 6 and 11. When the eight year old is potentially a freshman, his older sib is potentially a senior and when the eight year old is potentially a junior and senior, his younger sib is potentially a freshman and sophomore. The hypothetical child has 3 sib years of college age while the child is potentially in college.

Table 11C

Average Additional Sibling Years of College Age During Period Child of Age X is of College Age Per Family with Child of Age X

Age X		No. of Families with Children Age X (000's)		Potentially Entering College in	Average Additional Years of Potential Payment Due to Sibs Who Are:					
					Older*		Younger		Either	
Age in 1970	Age in 1960	1970 Data	1960 Data		1970 Data	1960 Data	1970 Data	1960 Data	1970 Data	1960 Data
3		153		1985	.99		.93		1.92**	
4		162		1984	1.16		.91		2.06	
5		172		1983	1.29		.92		2.21	
6		174		1982	1.40		1.05		2.45	
7		186		1981	1.40		1.20		2.60	
8		182		1980	1.49		1.28		2.76	
9		189		1979	1.46		1.33		2.78	
10		190		1978	1.47		1.28		2.76	
11		193		1977	1.42		1.40		2.82	
12		189		1976	1.39		1.35		2.75	
13	3	191	189	1975	1.49	1.39	1.36	1.40	2.85	2.79
	4		185	1974		1.31		1.35		2.66
	5		179	1973		1.34		1.36		2.70
	6		177	1972		1.24		1.33		2.57
	7		167	1971		1.17		1.21		2.39
	8		166	1970		1.19		1.22		2.41
	9		156	1969		1.21		1.22		2.42
	10		153	1968		1.16		1.19		2.36
	11		153	1967		1.06		1.13		2.19
	12		153	1966		.79		1.07		1.86
	13		141	1965		.78		1.00		1.78

*The data on older sibs includes data on sibs who are the same age in years (mostly twins).

**The total number of "overlap" years shown per family in this table is slightly less (typically .03 or .04) than the total number of "overlap" years shown per child in Table 11B, the difference being a function of the number of twins. From the standpoint of each child who is a twin, there are four years of overlap, or a total of eight years defined on the child basis. For the family, a set of twins creates four years of overlap, not eight.

Table 11D

Selected Measures of Sibling College Age Squeeze
for Families Having at Least One Child Age 3-15
by Total Number of Children in the Household

Total Number of Children in Family	Children Potentially in College During Period: A		B		C		D		E		No. of Families (000's)	
	1966-75	1976-85	1966-75	1976-85	1966-75	1976-85	1966-75	1976-85	1966-75	1976-85	1966-75	1976-85
1	2.85	2.68	2.85	2.68	1.00	1.00	0.00	0.00	49.4	48.0	168	156
2	4.01	3.77	4.61	4.43	1.14	1.15	1.06	1.15	48.0	46.0	316	341
3	5.36	5.37	6.93	7.14	1.29	1.33	2.69	2.83	47.1	46.0	247	270
4	6.47	6.65	9.30	9.93	1.45	1.50	3.88	4.09	46.7	45.9	136	155
5	7.35	7.54	11.90	12.22	1.64	1.63	5.06	5.12	46.9	46.2	60	86
6+	8.58	8.78	16.48	17.29	1.93	1.97	6.62	6.99	48.5	46.0	52	60

A. Average number of years at least one child will be college age for 10 year period 1966-75 or 1976-85.

B. Average total college age man-years for the 10 year period 1966-75 or 1976-85.

C. Average number of children of college age per year at least one child is of college age for 10 year period 1966-75 or 1976-85.

D. Average number of sibling years of college age for child with worst sibling overlap during four years of college age for that child for 10 year period 1966-75 or 1976-85.

E. Average age of family head at time child with worst overlap would enter college for ten year period 1966-75 or 1976-85.

Table 12

Enrollment Rate Projections by Age and Sex
for the U.S. and Michigan, 1970-1990

Baseline Data

Age	U. S. Population Rates: Civilian Non-Institutional 1969-71 C.P.S. Male	U. S. Population Rates: Civilian Non-Institutional 1969-71 C.P.S. Female	U. S. Population Rates: Total 1970 Census Male	U. S. Population Rates: Total 1970 Census Female	Michigan Population Rates: Total 1970 Census Male	Michigan Population Rates: Total 1970 Census Female	Michigan Population Rates: Adjusted[a] 1970 Male	Michigan Population Rates: Adjusted[a] 1970 Female
15-17	2.2	2.3	0.4	0.5	0.3	0.3	1.4	1.4
18-19	41.8	34.5	32.0	29.7	33.6	28.3	35.4	31.7
20-21	41.1	24.0	33.0	24.3	37.2	24.5	37.3	23.3
22-24	21.8	8.5	19.0	9.0	20.6	9.5	19.0	8.7
25-29	11.0	3.8	10.1	3.9	10.8	4.5	9.5	4.2
30-34	5.2	2.9	5.1	2.8	5.3	3.1	4.4	3.1
35-49	--	--	1.0	1.0	--	--	1.7	1.3

Projections of the U.S. Civilian Non-Institutional Population Rates[b]

	Male 1970	Male 1975	Male 1980	Male 1985	Male 1990	Female 1970	Female 1975	Female 1980	Female 1985	Female 1990
15-17	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3
18-19	41.8	34.5	33.0	42.0	46.0	34.5	31.5	30.0	38.0	41.5
20-21	41.1	32.0	31.0	41.0	45.0	24.0	25.0	25.0	32.0	35.5
22-24	21.8	18.0	17.0	22.0	24.0	8.5	9.5	10.5	12.0	13.5
25-29	11.0	11.6	12.3	13.3	14.5	3.8	4.9	6.0	7.1	8.2
30-34	5.2	5.6	6.0	6.7	7.5	2.9	3.6	4.3	5.0	5.7

Ratio of Projected Enrollment Rates to Enrollment Rates in 1970

	Male 1970	Male 1975	Male 1980	Male 1985	Male 1990	Female 1970	Female 1975	Female 1980	Female 1985	Female 1990
15-17	100	100	100	100	100	100	100	100	100	100
18-19	100	82	79	100	110	100	91	87	110	120
20-21	100	78	75	100	109	100	104	104	133	148
22-24	100	82	78	101	110	100	112	124	141	159
25-29	100	105	112	121	132	100	129	158	187	216
30-34	100	107	115	129	144	100	124	148	172	197

Projections of Adjusted[a] Rates for the Total Michigan Population

	Male 1970	Male 1975	Male 1980	Male 1985	Male 1990	Female 1970	Female 1975	Female 1980	Female 1985	Female 1990
15-17	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
18-19	35.4	29.2	28.0	35.6	38.9	31.7	28.8	27.6	34.8	38.2
20-21	37.3	29.1	28.0	37.3	40.7	23.3	24.2	24.2	31.0	34.5
22-24	19.0	15.6	14.8	19.2	20.9	8.7	9.7	10.8	12.3	13.8
25-29	9.5	10.0	10.6	11.5	12.5	4.2	5.4	6.6	7.9	9.1
30-34	4.4	4.7	5.1	5.7	6.3	3.1	3.8	4.6	5.3	6.1
35-49	1.7	1.9	2.1	2.3	2.5	1.3	1.5	1.7	1.9	2.1

[a] This set of rates is adjusted to the total Michigan population enumerated in April but consistent with opening fall degree credit enrollment figures obtained in October. The rates are adjusted separately to the sex totals given in the opening fall enrollment data.

[b] This set of projections is keyed to the data on siblings of college age, identified as Model 2 in later tables.

Table 13

Projected Degree Credit Enrollment in Michigan by Age and Sex: 1970-2000

Model 1[a]

Enrollment Rates

Age	Males							Females						
	1970	1975	1980	1985	1990	1995	2000	1970	1975	1980	1985	1990	1995	2000
15-17	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
18-19	35.4	35.4	35.4	35.4	35.4	35.4	35.4	31.7	31.7	31.7	31.7	31.7	31.7	31.7
20-21	37.3	37.3	37.3	37.3	37.3	37.3	37.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3
22-24	19.0	19.0	19.0	19.0	19.0	19.0	19.0	8.7	8.7	8.7	8.7	8.7	8.7	8.7
25-29	9.5	9.5	9.5	9.5	9.5	9.5	9.5	4.2	4.2	4.2	4.2	4.2	4.2	4.2
30-34	4.4	4.4	4.4	4.4	4.4	4.4	4.4	3.1	3.1	3.1	3.1	3.1	3.1	3.1
35-49	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.3	1.3	1.3	1.3	1.3	1.3	1.3

Enrollment (000's)

	Males							Females						
	1970	1975	1980	1985	1990	1995	2000	1970	1975	1980	1985	1990	1995	2000
15-17	4	4	4	3	3	4	5	4	4	4	3	3	4	5
18-19	57	68	67	59	57	56	71	53	60	59	52	50	49	62
20-21	49	68	70	64	60	54	65	37	42	45	41	39	34	42
22-24	38	46	54	53	45	44	45	19	22	25	24	21	20	21
25-29	28	33	41	46	44	39	37	13	16	19	21	20	18	16
30-34	11	13	16	20	22	21	18	8	9	12	14	16	15	13
35-49	13	12	13	15	18	22	24	10	10	10	12	15	17	18
Total	198[b]	244	265	260	249	240	265	144	163	174	167	164	157	177

[a] 1970 Michigan adjusted rates held constant throughout the projection period.

[b] 1970 figures will not necessarily sum to the total because of rounding.

Table 14

Projected Degree Credit Enrollment in Michigan by Age and Sex: 1970-2000

Model 2[a]

Enrollment Rates

Age	Males							Females						
	1970	1975	1980	1985	1990	1995	2000	1970	1975	1980	1985	1990	1995	2000
15-17	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
18-19	35.4	29.2	28.0	35.6	38.9	38.9	38.9	31.7	28.8	27.6	34.8	38.2	38.2	38.2
20-21	37.3	29.1	28.0	37.3	40.7	40.7	40.7	23.3	24.2	24.2	31.0	34.5	34.5	34.5
22-24	19.0	15.6	14.8	19.2	20.9	20.9	20.9	8.7	9.7	10.8	12.3	13.8	13.8	13.8
25-29	9.5	10.0	10.6	11.5	12.5	12.5	12.5	4.2	5.4	6.6	7.9	9.1	9.1	9.1
30-34	4.4	4.7	5.1	5.7	6.3	6.3	6.3	3.1	3.8	4.6	5.3	6.1	6.1	6.1
35-49	1.7	1.9	2.1	2.3	2.5	2.5	2.5	1.3	1.5	1.7	1.9	2.1	2.1	2.1

Enrollment (000's)

	Males							Females						
	1970	1975	1980	1985	1990	1995	2000	1970	1975	1980	1985	1990	1995	2000
15-17	4	4	4	3	3	4	5	4	4	4	3	3	4	5
18-19	57	56	53	59	63	61	77	53	55	52	57	60	59	75
20-21	49	53	53	64	66	58	71	37	44	47	55	57	51	62
22-24	38	38	42	53	49	48	50	19	25	31	34	33	32	33
25-29	28	35	46	56	58	51	48	13	21	30	39	43	38	35
30-34	11	14	18	25	31	30	26	8	12	18	24	31	29	26
35-49	13	14	16	20	27	32	35	10	11	13	18	24	28	30
Total	198[b]	214	232	280	297	284	312	144	172	195	230	251	241	266

[a] Projected enrollment rates based largely on data dealing with siblings of college age. See Tables 11 and 12.

[b] 1970 figures will not necessarily sum to the total because of rounding.

Table 15

Projected Degree Credit Enrollment in Michigan by Age and Sex: 1970-2000

Model 3[a]

Enrollment Rates

Age	Males							Females						
	1970	1975	1980	1985	1990	1995	2000	1970	1975	1980	1985	1990	1995	2000
15-17	1.4	1.4	1.5	1.5	1.5	—	1.6	1.4	1.5	1.6	1.6	1.7	—	1.9
18-19	35.4	38.9	42.1	45.3	47.8	—	52.4	31.7	34.9	38.7	41.5	45.3	—	51.0
20-21	37.3	41.0	44.4	47.0	50.4	—	55.2	23.3	25.6	28.4	30.5	33.3	—	37.5
22-24	19.0	20.9	23.0	25.1	27.0	—	31.2	8.7	10.1	11.1	13.2	14.8	—	17.9
25-29	9.5	10.7	12.1	13.5	14.8	—	17.3	4.2	4.9	5.8	6.7	7.6	—	9.3
30-34	4.4	5.1	5.9	6.7	7.5	—	9.1	3.1	3.7	4.4	5.1	5.8	—	7.2
35-49[b]	1.7	2.0	2.3	2.6	2.9	—	3.5	1.3	1.5	1.8	2.1	2.4	—	3.0

Enrollment (000's)

	Males							Females						
	1970	1975	1980	1985	1990	1995	2000	1970	1975	1980	1985	1990	1995	2000
15-17	4	4	4	4	3	—	5	4	4	4	4	4	—	6
18-19	57	75	80	76	77	—	104	53	66	72	68	72	—	100
20-21	49	74	84	81	81	—	97	37	47	55	54	55	—	67
22-24	36	51	66	70	64	—	74	19	26	32	37	35	—	43
25-29	28	37	53	66	69	—	67	13	19	26	33	36	—	36
30-34	11	15	21	30	37	—	38	8	11	17	23	29	—	30
35-49[b]	13	14	17	23	31	—	48	10	11	14	20	27	—	43
Total	198[c]	270	325	350	362	—	433	144	184	220	239	258	—	325

[a] Model 3 is based on the Census Bureau Series 1 projections and the Carnegie Commission projections, with rates adjusted to the total Michigan population.

[b] Not contained in the original projections, but consistent with changes for the population age 30-34.

[c] 1970 figures will not necessarily sum to the total because of rounding.

Table 16

Summary Measures of Enrollment in Institutions of Higher Education in Michigan: 1970-2000

Year	Degree Credit Enrollment (000's)			% Degree Credit Enrollment Female			% Degree Credit Enrollment 25+ Years		
	M1	M2	M3	M1	M2	M3	M1	M2	M3
1970	342	342	342	42%	42%	42%	24%	24%	24%
1975	407	386	454	40%	45%	41%	23%	28%	24%
1980	439	427	545	40%	46%	40%	25%	33%	27%
1985	427	510	589	39%	45%	41%	30%	36%	33%
1990	413	548	620	40%	46%	42%	33%	39%	37%
1995	397	525	—	40%	46%	—	33%	40%	—
2000	442	578	758	40%	46%	43%	29%	35%	35%

	Total[a] Enrollment (000's)		
	M1	M2	M3
1970	393	393	393
1975	471	446	525
1980	510	497	633
1985	499	596	689
1990	486	645	729
1995	470	621	—
2000	526	688	902

[a]Assuming degree credit enrollment declines from 87% to 84% of total enrollment between 1970 and 2000.

Table 17

Actual and Projected Percentage Distribution of Total Enrollment by Type of Institution, Michigan, 1960-2000[a]

Year	Public 4-Year Institution	Public 2-Year Institution	Private Institution	Total
1960-62 Avg.	62.1	17.0	20.9	100.0
1971-73 Avg.	53.5	34.2	12.3	100.0
1975	53.3	35.3	11.4	100.0
1980	53.0	37.0	10.0	100.0
1985	52.7	37.9	9.4	100.0
1990	52.5	38.7	8.8	100.0
1995	52.4	39.1	8.5	100.0
2000	52.2	39.5	8.3	100.0

[a]Projections of percentage distribution obtained by applying national proportional decline figures for private institutions given in HEW, Projections of Educational Statistics to 1979-80 and allocating the public two and four year residual according to the implied growth (or decline) for those institutions in the same publication. The 1970-80 proportional decline figures for private institutions were halved for 1980-90 and halved again for 1990-2000.

Table 17A

Projected Distribution of Total Enrollment by Type of Institution According to Model 2 Assumptions, Michigan, 1975-2000

Year	Public 4-Year Institution	Public 2-Year Institution	Private Institution	Total
1975	237	157	51	446*
1980	263	184	50	497
1985	314	226	56	596
1990	339	250	57	645
1995	325	243	53	621
2000	359	272	57	688

*All figures given in thousands.

Table 18

Distribution of Population and College Enrollment in Standard Metropolitan Areas of the State, 1960 & 1970

	1960			1970						
	% Population	% Enrollment	% Difference[a]	% Population	% Total Enrollment	% Degree Credit Enrollment	% "Other" Enrollment	% Difference Total	% Difference Degree Credit	% Difference "Other"
troit	48.1	28.5	-19.6	47.3	32.4	29.6	51.5	-14.9	-17.7	+4.2
int	4.8	3.9	-0.9	5.6	3.5	3.3	4.6	-2.1	-2.3	-1.0
and Rapids	4.6	3.2	-1.4	6.1	4.6	4.9	2.3	-1.5	-1.2	-3.8
sing	3.8	15.9	+12.1	4.3	13.3	14.3	7.0	+9.9	+10.0	+2.7
ginaw	2.4	0.0	-2.4	2.5	0.5	0.5	0.0	-2.0	-2.0	-2.5
n Arbor	2.2	21.9	+19.7	2.6	16.5	18.3	4.3	+13.9	+15.7	+1.7
lamazoo	2.2	7.1	+4.9	2.3	7.1	7.7	2.9	+4.8	+5.4	+0.6
skegon	1.9	0.7	-1.2	1.8	1.1	1.0	2.1	-0.7	-0.8	+0.3
ckson	1.7	1.0	-0.7	1.6	1.2	0.9	2.9	-0.4	-0.7	+1.3
y City	1.4	1.3	-0.1	1.3	1.5	1.0	4.9	+0.2	-0.3	+3.6
mainder	26.9	16.5	-10.4	24.6	18.3	18.5	17.5	-6.3	-6.1	-7.1
ate Total	100.0	100.0	±36.7	100.0	100.0	100.0	100.0	±27.9	±31.1	±14.4

[a] Percent enrollment minus percent population.

Why Have Enrollment Rates Changed?
What is the Rationale for the Enrollment Projections?

This report started with the proposition that the Carnegie Commission projections of college enrollment were too high. Since writing the first part of this report (fall, 1973) the Commission has revised its projections downward. The Bureau of the Census has not yet revised its projections, but we can be certain that its next set will show lower college enrollment than previously. Reasons for revisions of projections are clear--the proportion of high school graduates who have gone on to college in the same year has dropped off in the total population, among males, among females and among whites. Several types of reasons have been advanced for the changing enrollment rates: 1. the end of the Viet Nam war (this one doesn't help to explain the decline for females), 2. the changing "life style" of young adults who no longer see the university as the stepping stone to the life they want to achieve as adults (this is a fairly typical social science "story" that may or may not have some truth value), 3. young adults are less frequently moving directly from high school to college to job—there are interruptions in the sequence that reflect their search for a more meaningful and useful life (again this may or may not be true, but if the interruptions are temporary, one shouldn't project a long term lowering of the previous set of projections). In short, there was no underlying logic to the original projections and there is no compelling logic to the revisions.

Most projections are a mechanical extrapolation of past trends. In many instances these types of projections turn out to be fairly accurate because the inherent and usually unknown causes continue into the future without any major changes. We believe we can identify some changes that are taking place and that will clearly affect enrollment. These changes take

the form of demographic constraints which did not operate previously. This is not to argue that some of the reasons for the change advanced by educators or social scientists are incorrect. We simply don't know if their impressions are accurate.

College enrollment rates have risen continuously over time. During the period of gradual rise in enrollment, the fertility of the population had been declining. As everyone knows, there was an exceptionally sharp decline in fertility in the depression years. Children born during that period were enrolled in college during the period immediately following the close of World War II and up to the early or mid sixties. If one looks at an historical set of enrollment rates, we notice a "take off" in enrollment during the period the depression babies were in college and slightly beyond that point. Increases in enrollment were almost unprecedented. There were obviously many factors associated with the changing enrollment, but the position taken here is that the combination of demographic and economic constraints placed on families is one of the primary movers of enrollment rates. That is, a sharp fertility decline during the 1930's was one of the necessary conditions for the enormous enrollment increases twenty years later. Let us examine this in some detail for the family, the unit likely to bear the costs of enrollment.

Imagine a family in 1940 with seven year old and 11 year old children. Also imagine that these children eventually go to college, the older beginning in 1947 and the younger 1951. If both children go to four years of college the family faces an eight year period during which one child will be in school between 1947 and 1954. At no point are both children in college at the same time. For families whose children went to college during this period, there is nothing particularly unusual about our hypothetical

case. Women, whose prime years of fertility occurred during the 1930's averaged just a little more than two births per woman.

Now imagine a younger family whose children were born in the 1950's or 1960's. Let us say that in 1960 they had three children age seven, nine, and 11. These children potentially enter college in 1967, 1969, and 1971. Again, assuming that all children wish to attend and are capable of attending four years of college, the profile of college years for the family can be diagrammed as follows:

Date	Oldest Child	Middle Child	Youngest Child
1967	X		
1968	X		
1969	X	X	
1970	X	X	
1971		X	X
1972		X	X
1973			X
1974			X

This hypothetical family will have at least one child in school for a period of eight years as was the case with the earlier family. However, there is a crucial difference: The second family faces 12 years of college fees over the eight year period. In four of the years there is one child in college. In the other four years there are potentially two children in college. Suppose we continue with the scenario, working our way forward from 1967. By 1969 the oldest child is a junior and the middle child is a freshman. The years 1969 and 1970 are double payment years for the family and after some difficulties, they manage. The unusual drain on resources in 1969 and 1970 makes 1971 a rather crucial year. The middle child, who is a junior by then continues in college. But what happens to the youngest child who would normally be a freshman? Savings have dwindled over the previous two years in particular and the family's economic ability to handle a third year of double payment with, by that time, the recognition that enrollment of the

youngest child will automatically produce a fourth year of double payment followed by two years of single payment, when the youngest is a junior and senior, results in a reconsideration of college for the youngest child and undoubtedly, a lower probability of attendance.

So that the reader does not think of this as some propogandistic myth, a few demographic and economic facts should be made clear:

1. By the 1950's and 1960's, American women were having an average of more than three children.
2. During that period the average interval between births had declined considerably from the situation 10 and 20 years earlier. Median interval from marriage to first birth was considerably less than 1 1/2 years and median interbirth intervals (1st to 2nd, 2nd to 3rd, etc.) were typically about two years. Even in the absence of a change in total number of births, the condensing of birth intervals leads to greater overlapping of college ages for children twenty years later. That is, the economic burden becomes more intense for a given year.
3. In 1950, in-state tuition at one major institution in Michigan was $75 per semester. Today, it is $425 per semester. Comparable figures for out of state students were $200 in 1950 and $1350 today.
4. In 1950 room and board at a/dorritory was $282 per semester. The current figure is $750.

We firmly believe that the combination of demographic constraints produced by changes in the number and spacing of children, plus the relative increase in the costs of providing a college or university education have resulted in a decline in enrollment rates. We also believe that in the

absence of a major policy change, there will be a substantial increase in the number of qualified students who do not attend college. The state and the nation will be deprived of this talent. Fortunately, we can demonstrate a foreseeable end to the demographic-economic bind we are now experiencing. The policy issue we face is whether or not we choose to ignore the problem that will be with us for the next ten years.

The enrollment projections contained in this report (Model 2) are keyed to the problem we have tried to highlight with our not so hypothetical examples. We can now turn to its details.

How Can the Problem be Quantified?

In 1973, the number of students enrolled in institutions of higher education declined from the previous year, according to figures reported by the Census Bureau's Current Population Survey. Since the number of college age persons is increasing, this must reflect a major downward shift in enrollment rates.

Peak national college enrollment rates existed in 1969 (see Table 9). Up to that time age-sex groups had experienced increases in their enrollment rates. Since then, the picture has become highly uneven. The enrollment rates for young males have decreased considerably from 44.0% in 1969 to 34.8% in 1973 among those aged 18 and 19 and from 44.7% to 33.6% among those aged 20 and 21. The enrollment rates for young women age 18-19 declined less dramatically from 34.4 to 31.2 during the same period. Enrollment rates for the population age 25-29 and 30-34 have continued upward for both sexes during this period. Although the changing mix of college students is of considerable interest, it is the behavior of the new waves of high school graduates that is most revealing about the future. It is their decline in enrollment that mirrors the economic difficulties being experienced by families.

We can get a handle on this demographic-economic problem by manipulating the Census Bureau Public Use Tapes. Until these tapes were made available, the only information available from the Census, relevant for projections of enrollment, were age distributions and enrollment rates. The large increase in the number of college age persons facing us during the 1970's was obvious from the age distributions. After adjustment for migration it was fairly obvious that the population age 18-24 would increase by more than 20% between 1970 and 1975, etc. A history of increasing enrollment rates and figures like these produce the massive increases in projected enrollment shown in the Carnegie Commission Report.

What was not revealed by the Census Bureau age distributions was the spacing of children and the resultant "sibling problem" confronting families. With a Census tape it is possible to identify each family and the age distribution of children within each family. Assuming that children enter college at 18 and remain until they are 21, it is possible through tape manipulation to determine what kind of potential college age overlap problem exists among sibs in each family, for a given year, for a given period, among families having a seven year old and so on. We have taken the 1960 and 1970 Census data for Michigan, "glued them together," and have produced a set of data dealing with the sibling overlap problem as it applies to the potential college entrance years of 1962 (when a child age 16 in 1960 potentially enters college) to 1988 (when a child age 0 in 1970 potentially enters college). These data are displayed in Tables 11 to 11D.

Table 11 contains some basic materials on changes in the spacing of children. For example, among families containing a child age 12-14 in 1960 (potentially entering college 1964-1966), the percentage who also had a sib one year older was 10-12%. This percentage is almost doubled among

families with a 3-5 year old in 1960 or a 13-15 year old in 1970 (potentially entering college 1973-1975) reflecting the compression of birth intervals. Similar data are shown for families with children of age X and X + 2, the proportion with a two year spacing. What is particularly interesting about both of these series is that the peak of the sibling overlap problem does not occur until about college entry year 1980 and then begins to work its way back to the levels of the mid or early sixties. The meaning should be clear: 1. We have not seen the worst of this problem yet--it becomes increasingly more difficult for cohorts entering college in 1975-80. 2. The problem begins to ease off during the 1980's.

In Table 11A, we attempt to deal with the magnitude of the sibling overlap problem by using a range of ages. If there are two children in a family, one aged X and one aged X + 3, the older child will be a senior when the younger child is a freshman. Any separation of three years or less is likely to result in a sibling overlap in potential college attendance. The parents would be paying for more than one child in college for a given year (see footnote to the table). We show the ratio of siblings at age X to X + N (where N is 2, 3, 4) to all families containing a child of age X. In the mid sixties this ratio (for X + 3) is .40-.50. By 1980, it is .74 and declines to .51 by 1988. This series parallels the proportion of families experiencing overlap. We have focused on older sibs (+ rather than -) because that is probably how families encounter and deal with the problem. If an older sib is already in school, the burden is on the younger child. It seems unlikely that families confront the issue by taking into account the overlap problem that the child of age X faces because of younger sibs.

Table 11B displays the data in another way by dealing with the following question: When a child of age X is 18-21 (potentially in college),

how many additional years of college will the parents potentially have to pay for because of overlap with other siblings? For children entering college in 1965, parents were potentially responsible for 1.8 additional sib years--six years payment in four years time. By 1975-80, parents are potentially responsible for an additional 2.8 years--about seven years payment in four years time. By 1985 the situation is very similar to 1965. Even if relative college costs were identical over time (which they are not), there is an extra year to be paid for in the same amount of time.

Table 11C illustrates the overlap problem by reference to older sibs "already in college" and younger sibs who will be in college as the child of age X progresses through his four years. The series on older sib overlap is especially dramatic comparing the recent past with the near future. Between 1975 and 1980, parents will be responsible for almost twice the amount of overlap years, .78 in 1965, between 1.39 and 1.49 from 1975 to 1980. We usually notice our problems after the fact. The series for older sibs will probably be a better predictor of enrollment rates than either total overlap or younger sib overlap.

The final table in the demographic-economic constraint series, 11D, provides information on several college dimensions for the periods 1966-75 and 1976-85. In the coming decade, a family with 3 children (at least one of whom is age 3-15), the most typical we can choose, will have potentially, at least one child in college for 5.37 years of the ten (A), will potentially pay for 7.14 years (B), will be confronted with a 2.83 year overlap for the child that has the worst overlap (D), and the head of the family will be 46 years old when that child enters college (E). The reader may note that these figures are worse than the comparable figures for a three child family in the previous decade--all resulting from the compression in childspacing, not from changes in the number of children.

How Do Demographic Constraints Translate To Economic Constraints?

We have seen that the average Michigan family having a child potentially entering college some time between 1975 and 1980 has the gloomy economic prospect of financing that child's four years of college plus another three years generated by other sibs, all within the four years college time of the child on which we focus. There are still other children and other years, but let us concentrate only on those four years.

If the children go to school in-state, but away from home, the four year potential cost would be approximately $21,000 (7 x $3,000). If the children went to school out of state, the cost would be about $35,000 (7 x $5,000). And that is at current rates. We are dealing with a financial problem that is as large as a home mortgage but would have to be paid off in four years instead of 15, 20, 25, 30 years.

Given: 1. the enormous pressures to increase tuitions--an understandable phenomenon from the standpoint of the college or the legislature that provides money for the college, 2. the pressure on colleges to decrease the differential between in-state and out-state fees as they lose their court battles on residence requirements (which can only lead to higher in-state fees), and 3. the decrease in real income over the past two years with almost certainty for another decrease this year--we are led back to the second paragraph of this section (even if one wanted to quibble over the cost figures employed). It is ridiculous to assume that families of talented children will be in a position to pay off a house mortgage equivalent in four years. The family economic problem is so great, there is no need to elaborate the point.

How Do These Data Fit the Projections?

One would like to be in a projection position in which it was possible to state "for every so many units of older sib overlap pressure there is such and such decline in the enrollment rate." We are not in that situation, at present. Our time perspective on sibling overlap is essentially limited to the period 1965-1985 and we have enrollment data only through 1973-74. A longer time perspective (backwards) on sibling overlap should be pursued. This is obviously a next research step requiring data for individual families (or an appropriate proxy) in 1950 and 1940. What we have in Tables 11-11D is a series on sibship that very strongly suggests a linkage between this phenomenon and college enrollment. It is one of several variables that contribute to an explanation of enrollment. We believe it may be the one most powerful explanation. Knowledge of what the sibship series would roughly look like over the past 40 years and knowledge of what the enrollment rates have looked like, makes it fairly "obvious" that the two series correlate rather highly. Moreover, the fact that the correlation would appear to better fit the case of the 18-20 year old rather than the case of the 22-29 year old makes good intuitive sense. Older students are largely an economic unit themselves, independent of younger sibs who may still be in the family of orientation. Among older students in graduate school, the case was, in effect, decided some time ago.

In the absence of a systematic, quantitative relationship between the two variables, we have made the following qualitative translations:

Period	Sibling Overlap-Known	Enrollment Rates, Young Males-Unknown
1970-75	Up, considerably	Down, considerably
1975-80	Stable, high	Down, slightly
1980-85	Down, considerably	Up to 1970 figures
1985-90	No data but clearly will be down again and possibly below the figures for the depression babies	Up again, slightly above peak figures for the late sixties

The projection stemming from the assumed relationship is identified as Model 2 and shown in Tables 12 and 14. In this model, we have assumed considerably smaller enrollment rate declines for young women during the 1970's. The difference in assumptions by sex results in almost equal enrollment rates for young men and women age 18-19 by 1980. In Model 2, we have also assumed that enrollment rates for the population age 25 and older will continue to increase throughout the projection period. The 1990 rates are frozen for the following ten years on the assumption that we will have reached an asymptote defining the limits of quality in the population and admissibility to institutions of higher education as we know them today. Changes in the nature and function of colleges could make this assumption appear foolish.

The Model 2 projections in this report differ substantially from the projections developed by the Carnegie Commission. As a whole, they are much lower for two reasons:

1. The Commission projections involve enrollment rates up to 54% of the young population. An almost infinite variety of circumstances prevents a substantial number of high IQ persons from attending college. Reaching a 54% figure necessarily implies considerable degree credit enrollment for low IQ persons. It is not made clear how advanced training would benefit the low IQ population. In making projections, one has to be cautious about projecting monotonic

trends to impossible or apparently impossible conclusions, or you reach participation rates of greater than 100%, as for example, in labor force projections. The Commission "error" appears to follow this pattern.

2. The Carnegie Commission projections follow a pattern they identify as "go, stop, go," implying large college enrollment increases in the 1970's, small ones in the 80's and large increases in the 1990's. This reflects the relative size and growth of the population age 18-24. Our projections follow a totally different pattern because of the assumed changes in enrollment rates resulting from the college age sib squeeze. In Model 2 the largest increase in enrollment is assumed to occur in 1980-85, when the sib squeeze begins to ease off (see Table 16).

As a contrast to the projections we believe are closest to reality (Model 2), two other sets are included in the report:

1. Model 1: Enrollment rates are kept constant at the 1970 levels. Changes in projected enrollment are entirely a function of changes in the size of the college age population.
2. Model 3: Enrollment rates continue upward through the 1970's, 80's and 90's. This model is very similar to the Carnegie Commission projections and the Census Bureau projections.

Criticism of the Sibling Squeeze Argument

A potential criticism of the data presented in this report might stress one or both of the following:

1. The report deals with the sibling squeeze as if all sibs were headed for college. Clearly, all children do not go to college. That is true, of course, but irrelevant for the position we have taken. We argue that relative changes in the number of sibs simultaneously in college is creating a demographic-economic

constraint that leads to a lowering of enrollment rates. If we applied some constant, say 35%-40%, to the sibling data, the relative changes between the 1950's, 1960's, 1970's and 1980's would still look the same. We are in the midst of a squeeze that will continue unabated for several years before it declines again to manageable numbers. In fact, if we applied more realistic figures on college enrollment to the sibling squeeze argument, we would arrive at a conclusion demonstrating that the economic constraints placed on families in the 1970's and 1980's are greater than we show. The movement of higher education from an "elitist" institution to a more "democratic" institution means that the correction factors applied in the 1950's (proportion who do go to college) should be smaller than the correction factors applied in the 1970's and 1980's. Similar conclusions would be reached if we used a correction factor for the relative cost of college. We are not overstating the problem; we are understating the problem.

2. The report fails to take into account differences in the college age sib squeeze for different groups in the state. That is not only correct, it is exceptionally important. Further research on this topic should explore the demographic constraints in relation to the economic circumstances of the family. The sibling overlap figures for each group should be "corrected" for the child's desire and ability to go to college. When these data are associated with the economic circumstances of the parents, we will know exactly where and in what segments of the population the squeeze is most pronounced. At that point, we

should examine the rules and regulations governing loans and scholarships to determine whether or not we have a sane system of support that will benefit the society and the individual.

Policy

It is our impression that about one of four potential students who would normally and should be attending college over the next ten years, will not attend college in the absence of a support program.[1] The problem will be with us for about ten years and then disappear. We know that. We can choose to ignore the problem, noting that the problem has a fixed duration. Or we can attempt to solve the problem.

Arguments for ignoring the problem will probably fix on the individual or family responsibility theme. Families had a choice in the fifties and sixties. They could have the number of children they wanted and they could have spaced them as they wanted. Should the government now take the responsibility for their fertility behavior twenty years ago? This position has great appeal to many Americans. It argues for individual responsibility, against a welfare state approach. It implicitly criticizes the "modern" social science orientation that attributes almost all ills to society. It laughs at our new "insights" in the same sense that we laugh at our understanding of the world when the delinquent in West Side Story sings "Gee, Officer Krupke." And it has considerable merit.

What it fails to take into account is the ten year loss of talent on the society as a whole. How far will that set us back and at what cost?

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1. We are ignoring the fact that any college system will always fail to attract a subset of the most talented young people. Those excluded will vary with the type of system in existence. The one in four figure refers to anticipated declines in enrollment rates for the population age 18-19.

This is no easy question to answer, but we suspect the costs are potentially very great whether we consider this from the standpoint of running an efficient machine, the input being the talented people, the output their products for society or whether we consider this from the standpoint of movement toward democratic goals. A ten year setback can have enormous implications, which will generate "costs" we will live with for a much longer period.

We see two types of escape valves that could help us out of this temporary economic bind: 1. better locations for colleges so that students can attend school in their local communities, avoiding some of the crushing economic costs associated with living away from home, and 2. a governmental low interest loan program that would have several characteristics of a mortgage.

Michigan has a rather poor distribution of college facilities in relation to the population. Some of the largest facilities are in areas well beyond a commuting distance. In Table 18 we have divided the state into 11 areas, the ten Standard Metropolitan Statistical Areas and the remainder. For 1960 and 1970, we show the distribution of college enrollment and the distribution of population. For each unit, the difference between the percent population and percent enrollment is a rough indicator of maldistribution of facilities. The sum of the positive or negative differences, the coefficient of dissimilarity, provides the percentage of college enrollment that would have to be redistributed to match population. For 1960, this figure is 36.7% and for 1970 it is 28%-31%, depending on whether we focus on degree credit enrollment or total enrollment. The comparable figure for the state of California in 1960 was 8.8%. One cannot transport already existing institutions from one area to another, but the table illustrates where the major gaps exist. The Detroit metropolitan area, for example, comes up 187

short of its population figure on degree credit enrollment. Efforts to generate expansion in areas that are "undercolleged," such as the Detroit area, would move us a long way in the direction of making it economically possible for potential students to attend school. A newer system, like the California system, where colleges are located close to the population centers, has one of the highest enrollment rates in the country. We suspect there is a systematic relationship between location efficiency and enrollment.

An alternative "solution" that must be taken seriously is a low interest loan program that would last from "now" until the mideighties when the squeeze disappears. Regulations governing such a program should be defined in relation to economic needs, the squeeze encountered by each family and the ability of the children--along lines described under 2. of the previous section. The form of the program could be a low interest tuition loan extended to families and based on continuing attendance. Families may be a better source of repayment than students. Loan repayment plans would have to extend over a fairly long period, say 15 years, with an arbitrary upper loan limit requiring families to choose between financing one child's tuition at an out-state school or several children at an in-state school. Our task was to develop projections of enrollment, not to develop details of policy. We believe a loan program resembling home mortgages has some merit and we simply mention it as a possibility.

One of the functions of demographic work is to develop projections of circumstances already built into a population so that the society can respond in a "rational and responsible" manner. Projections are tools of planning. It is critical that this demographic problem, dealing with college enrollment, be refined in ways that will make it a useful input to sensible

planning. The sibling problem in Michigan is not very different from the problem that faces the country. Let us respond to it in intelligent ways rather than factional ways.