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EFFECTS OF THE EARLY AND PERIODIC SCREENING, DIAGNOSIS AND TREATMENT (EPSDT) PROGRAM ON THE HEALTH STATUS OF PARTICIPANTS IN MICHIGAN

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EFFECTS OF THE EARLY AND PERIODIC SCREENING, DIAGNOSIS AND TREATMENT (EPSDT) PROGRAM ON THE HEALTH STATUS OF PARTICIPANTS IN MICHIGAN

By

William J. Keller

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ABSTRACT

EFFECTS OF THE EARLY AND PERIODIC
SCREENING, DIAGNOSIS AND TREATMENT (EPSDT) PROGRAM
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Since 1973 the federal government has required that each state offering a Title XIX (Medicaid) program will also offer the Early and Periodic Screening, Diagnosis and Treatment (EPSDT) program to Medicaid eligibles under the age of twenty-one years. The purpose of this study was to determine whether there are indications that EPSDT is benefitting participants in Michigan.

Two outcome measures were used to assess program effects: (1) referral rates and (2) medical costs. The primary independent variable was the number of lifetime EPSDT screenings received. The general relationship tested was whether referral rates and costs vary inversely with program participation.

A computer-based study was designed to test these relationships and two populations of clients were selected. One consisted of clients continuously eligible for EPSDT between January 1, 1974 and December 31, 1979 and numbered 79,754. The other population consisted of those eligible for calendar year 1979 and numbered 245,551. A search of the EPSDT master file of 535,753 screening summaries determined the referral rate at the last (most recent) screening. 56,046 of the former group and 154,187 of the latter had been screened.

Results showed referrals decreased ten percent or less between screenings one-five each, given a test group size of one hundred or more subjects. Medicaid costs were not found to be inversely related to lifetime screenings but when Medicaid costs of all EPSDT participants were compared with the Medicaid costs of the EPSDT nonparticipants, the participants showed statistically significant lower costs. The continuously eligible group incurred \$26.18 less per person ($p \leq .05$); the one-year eligibles incurred \$46.52 less per person ($p \leq .007$). However, when costs of the screening program itself were also considered, differences favoring the participants were replaced by somewhat greater costs attributable to program participation.

Other major findings were: (1) Referrals had decreased annually at the rate of approximately eight percent per year. (2) Referral rates average nearly fifty to one hundred percent higher in Detroit than in rural, outstate Michigan, with race held constant. (3) Blacks have referral rates 20-23 percent higher than whites but black EPSDT participants show lower medical costs whereas white participants do not.

The study concluded that the program is achieving modest gains at modest costs.

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DEDICATION

To my family and especially to my mother who gave so much for my education.

TABLE OF CONTENTS

		Page
LIST OF TABLES		ix
LIST OF FIGURES		xxiii
Chapter		
I.	INTRODUCTION	1
II.	REVIEW OF LITERATURE	11
	Background on EPSDT	11
	Outcome Studies of NonEPSDT Screening Programs	21
	Outcome Studies of the EPSDT Program	29
	Relationship of Demographic Factors to Health	38
III.	RESEARCH AND DESIGN METHODLOGY	46
	Objective of Study	46
	Hypotheses	46
	Questions	47
	Design I Referral Rate Differences	47
	Table I/II Replications	50
	Design I Statistical Analysis	52
	Design II Cost Differences	57
	Design II Statistical Analysis	60
	Design III Short-Run Cost Differences	62
	Design III Statistical Analysis	63
	Procedures - Sample	64
	Collection of Data	67
IV.	RESULTS	71
	Table I Results	71
	Table II Results	95
	Table III and IV Results	130
	Analysis of Covariance	133
	CPA Results	147
	Results on Costs, Tests of Hypothesis 2	150
	Student's t-Test	151
	Results on Costs, Tests of Hypothesis 3	165

Chapter	Page
V. SUMMARY AND CONCLUSIONS	167
Summary of EPSDT Program	167
Summary of Screening Program Outcomes	168
Summary of Research Design and Methodology	170
Summary of Results	173
Validity of Referral Rates as Indicators of Health Status	180
Implications of Study for EPSDT and Social Work	187
Recommendations for Future Study	191
Conclusions	192
BIBLIOGRAPHY	193
APPENDICES	198
Appendix A	198
Appendix B	216
Appendix C	234
Appendix D	251
Appendix E	268
Appendix F	285
Appendix G	302
Appendix H	304
Appendix I	308
Appendix J	310

LIST OF TABLES

Table		Page
Reference Table 1.	Percent of eligibles and percent of eligibles screened, by age	6
Reference Table II.	Per capita service utilization for all services, by year of service and state	32
Reference Table III.	Per capita costs for all services, by year of service and state	32
I.	Average number of referrals at last screening for long-term eligibles by age and number of lifetime screenings	74
I(A).	Average number of referrals at last screening for long-term eligible whites, by age and number of lifetime screenings	76
I(B).	Average number of referrals at last screening for long-term eligible blacks, by age and number of lifetime screenings	77
I(C).	Average number of referrals at last screening for long-term eligible American Indians, by age and number of lifetime screenings	78
I(D).	Average number of referrals at last screening for long-term eligible Spanish-speaking, by age and number of lifetime screenings	80
I(E).	Average number of referrals at last screening for long-term eligible males, by age and number of lifetime screenings	82
I(F).	Average number of referrals at last screening for long-term eligible females, by age and number of lifetime screenings	83

Table		Page
I(G).	Average number of referrals at last screening for long-term eligible white males, by age and number of lifetime screenings	84
I(H).	Average number of referrals at last screening for long-term eligible white females, by age and number of lifetime screenings	85
I(I).	Average number of referrals at last screening for long-term eligible black males, by age and number of lifetime screenings	86
I(J).	Average number of referrals at last screening for long-term eligible black females, by age and number of lifetime screenings	87
I(K).	Average number of referrals at last screening for long-term eligible American Indian males, by age and number of lifetime screenings	88
I(L).	Average number of referrals at last screening for long-term eligible American Indian females, by age and number of lifetime screenings	89
I(M).	Average number of referrals at last screening for long-term eligible Spanish-speaking males, by age and number of lifetime screenings	90
I(N).	Average number of referrals at last screening for long-term eligible Spanish-speaking females, by age and number of lifetime screenings	91
I(O).	Average number of referrals at last screening for long-term eligible participants in Detroit, by age and number of lifetime screenings	93
I(P).	Average number of referrals at last screening for long-term eligible participants in forty-four Northern Michigan counties, by number of lifetime screenings	94
I(Q).	Average number of referrals at last screening for long-term eligible participants in Detroit and Northern Michigan, by race and number of lifetime screenings	96
I(R).	Average number of referrals at last screening for long-term eligibles, by number and year of screening ($N \geq 100$)	124

Table		Page

I(S). Percent change in average number of referrals at last screening as number of lifetime screenings increase by one for long-term eligibles, by year of screening ($n \geq 100$) 126

II. Average number of referrals at last screening for one-year eligibles by age and number of lifetime screenings 98

II(A). Average number of referrals at last screening for one-year eligible whites, by age and number of lifetime screenings 99

II(B). Average number of referrals at last screening for one-year eligible blacks, by age and number of lifetime screenings 100

II(C). Average number of referrals at last screening for one-year eligible American Indians, by age and number of lifetime screenings 102

II(D). Average number of referrals at last screening for one-year eligible Spanish-speaking, by age and number of lifetime screenings 103

II(E). Average number of referrals at last screening for one-year eligible males, by age and number of lifetime screenings 105

II(F). Average number of referrals at last screening for one-year eligible females, by age and number of lifetime screenings 106

II(G). Average number of referrals at last screening for one-year eligible white males, by age and number of lifetime screenings 108

II(H). Average number of referrals at last screening for one-year eligible white females, by age and number of lifetime screenings 109

II(I). Average number of referrals at last screening for one-year eligible black males, by age and number of lifetime screenings 110

II(J). Average number of referrals at last screening for one-year eligible black females, by age and number of lifetime screenings 111

Table		Page

II(K). Average number of referrals at last screening for one-year eligible American Indian males, by age and number of lifetime screenings 112

II(L). Average number of referrals at last screening for one-year eligible American Indian females, by age and number of lifetime screenings 113

II(M). Average number of referrals at last screening for one-year eligible Spanish-speaking males, by age and number of lifetime screenings 114

II(N). Average number of referrals at last screening for one-year eligible Spanish-speaking females, by age and number of lifetime screenings 115

II(O). Average number of referrals at last screening for one-year eligible participants in Detroit, by number of lifetime screenings 118

II(P). Average number of referrals at last screening for one-year eligible participants in forty-four Northern Michigan counties, by number of lifetime screenings . 119

II(Q). Average number of referrals at last screening in Detroit and Northern Michigan, by race and number of lifetime screenings 121

II(R). Average number of referrals at last screening for one-year eligibles, by number and year of screening ($n \geq 100$) 127

II(S). Percent change in average number of referrals at last screening as number of lifetime screenings increase by one, for one-year eligibles by year of screening ($n \geq 100$) 129

III. Average number of referrals at last screening in 1978 for long-term eligibles, by age and number of lifetime screenings 234

III(A). Average number of referrals at last screening in 1978 for long-term eligible whites, by age and number of lifetime screenings 235

III(B). Average number of referrals at last screening in 1978 for long-term eligible blacks, by age and number of lifetime screenings 236

Table		Page

III(C). Average number of referrals at last screening in 1978 for long-term eligible American Indians, by age and number of lifetime screenings 237

III(D). Average number of referrals at last screening in 1978 for long-term eligible Spanish-speaking, by age and number of lifetime screenings 238

III(E). Average number of referrals at last screening in 1978 for long-term eligible males, by age and number of lifetime screenings 239

III(F). Average number of referrals at last screening in 1978 for long-term eligible females, by age and number of lifetime screenings 240

III(G). Average number of referrals at last screening in 1978 for long-term eligible white males, by age and number of lifetime screenings 241

III(H). Average number of referrals at last screening in 1978 for long-term eligible white females, by age and number of lifetime screenings 242

III(I). Average number of referrals at last screening in 1978 for long-term eligible black males, by age and number of lifetime screenings 243

III(J). Average number of referrals at last screening in 1978 for long-term eligible black females, by age and number of lifetime screenings 244

III(K). Average number of referrals at last screening in 1978 for long-term eligible American Indian males, by age and number of lifetime screenings 245

III(L). Average number of referrals at last screening in 1978 for long-term eligible American Indian females, by age and number of lifetime screeings 246

III(M). Average number of referrals at last screening in 1978 for long-term eligible Spanish-speaking males, by age and number of lifetime screenings 247

III(N). Average number of referrals at last screening in 1978 for long-term eligible Spanish-speaking females, by age and number of lifetime screenings 248

Table		Page
III(O).	Average number of referrals at last screening in 1978 for long-term eligible participants in Detroit, by age and number of lifetime screenings	249
III(P).	Average number of referrals at last screening in 1978 for long-term eligible participants in forty-four Northern Michigan counties, by number of lifetime screenings	250
IV.	Average number of referrals at last screening in 1978 for one-year eligbles, by age and number of lifetime screenings	268
IV(A).	Average number of referrals at last screening in 1978 for one-year eligible whites, by age and number of lifetime screenings	269
IV(B).	Average number of referrals at last screening 1978 for one-year eligible blacks, by age and number of lifetime screenings	270
IV(C).	Average number of referrals at last screening in 1978 for one-year eligible American Indians, by age and number of lifetime screenings	271
IV(D).	Average number of referrals at last screening in 1978 for one-year eligible Spanish-speaking, by age and number of lifetime screenings	272
IV(E).	Average number of referrals at last screening in 1978 for one-year eligible males, by age and number of lifetime screenings	273
IV(F).	Average number of referrals at last screening in 1978 for one-year eligible females, by age and number of lifetime screenings	274
IV(G).	Average number of referrals at last screening in 1978 for one-year eligible white males, by age and number of lifetime screenings	275
IV(H).	Average number of referrals at last screening in 1978 for one-year eligible white females, by age and number of lifetime screenings	276
IV(I).	Average number of referrals at last screening in 1978 for one-year eligible black males, by age and number of lifetime screenings	277

Table		Page

IV(J).	Average number of referrals at last screening in 1978 for one-year eligible black females, by age and number of lifetime screenings	278
IV(K).	Average number of referrals at last screening in 1978 for one-year eligible American Indian males, by age and number of lifetime screenings	279
IV(L).	Average number of referrals at last screening in 1978 for one-year eligible American Indian females, by age and number of lifetime screenings	280
IV(M).	Average number of referrals at last screening in 1978 for one-year eligible Spanish-speaking males, by age and number of lifetime screenings	281
IV(N).	Average number of referrals at last screening in 1978 for one-year eligible Spanish-speaking females, by age and number of lifetime screenings	282
IV(O).	Average number of referrals at last screening in 1978 for one-year eligible participants in Detroit, by age and number of lifetime screenings	283
IV(P).	Average number of referrals at last screening in 1978 for one-year eligible participants in forty-four Northern Michigan counties, by number of lifetime screenings	284
V.	Results of analysis of covariance for long-term eligibles	138
VI.	Results of analysis of covariance for short-term eligibles	146
VII.	Results of comparison of medical costs for long-term Medicaid eligible EPSDT participants and nonparticipants	153
VIII.	Results of comparison of medical costs for short-term Medicaid eligible EPSDT participants and nonparticipants	154
IX.	Results of comparison of medical costs for long-term Medicaid eligible white EPSDT participants and nonparticipants	155

Table		Page

Table		Page
X.	Results of comparison of Medicaid costs for short-term Medicaid eligible white EPSDT participants and nonparticipants	157
XI.	Results of comparison of medical costs for long-term Medicaid eligible black EPSDT participants and nonparticipants	158
XII.	Results of comparison of medical costs for short-term Medicaid eligible black EPSDT participants and nonparticipants	159
XIII.	Results of comparison of medical costs for short-term Medicaid eligible American Indian EPSDT participants and nonparticipants	160
XIV.	Results of comparison of medical costs for short-term Medicaid eligible American Indian EPSDT participants and nonparticipants	161
XV.	Results of comparison of medical costs for long-term Medicaid eligible Spanish-speaking EPSDT participants and nonparticipants	163
XVI.	Results of comparison of medical costs for short-term Medicaid eligible Spanish-speaking EPSDT participants and nonparticipants	164
XVII.	Summary of the analysis of covariance for long-term eligibles	302
XVIII.	Summary of the analysis of covariance for one-year eligibles	308
I(a).	Number of long-term eligible screened, by age and number of lifetime screenings	198
I(Aa).	Number of long-term eligible whites screened, by age and number of lifetime screenings	199
I(Ba).	Number of long-term eligible blacks screened, by age and number of lifetime screenings	200
I(Ca).	Number of long-term eligible American Indians screened, by age and number of lifetime screenings . .	201
I(Da).	Number of long-term eligible Spanish-speaking screened, by age and number of lifetime screenings . .	202
I(Ea).	Number of long-term eligible males screened, by age and number of lifetime screenings	203

Table		Page
I(Fa).	Number of long-term eligible females screened, by age and number of lifetime screenings	204
I(Ga).	Number of long-term eligible white males screened, by age and number of lifetime screenings	205
I(Ha).	Number of long-term eligible white females screened, by age and number of lifetime screenings	206
I(Ia).	Number of long-term eligible black males screened, by age and number of lifetime screenings	207
I(Ja).	Number of long-term eligible black females screened, by age and number of lifetime screenings	208
I(Ka).	Number of long-term eligible American Indian males screened, by age and number of lifetime screenings	209
I(La)	Number of long-term eligible American Indian females screened, by age and number of lifetime screenings	210
I(Ma).	Number of long-term eligible Spanish-speaking males screened, by age and number of lifetime screenings	211
I(Na).	Number of long-term eligible Spanish-speaking females screened, by age and number of lifetime screenings	212
I(Oa).	Number of long-term eligible participants screened in Detroit, by age and number of lifetime screenings	213
I(Pa).	Number of long-term eligible participants screened in forty-four Northern Michigan counties, by number of lifetime screenings . . .	214
I(Qa).	Number of long-term eligibles screened in Detroit and Northern Michigan, by race and number of lifetime screenings	215

Table | Page

II(a). Number of one-year eligibles screened, by age and number of lifetime screenings 216

II(Aa). Number of one-year eligible whites screened, by age and number of lifetime screenings 217

II(Ba). Number of one-year eligible blacks screened, by age and number of lifetime screenings 218

II(Ca). Number of one-year eligible American Indians screened, by age and number of lifetime screenings 219

II(Da). Number of one-year eligible Spanish-speaking screened, by age and number of lifetime screenings 220

II(Ea). Number of one-year eligible males screened, by age and number of lifetime screenings 221

II(Fa). Number of one-year eligible females screened, by age and number of lifetime screenings 222

II(Ga). Number of one-year eligible white males screened, by age and number of lifetime screenings 223

II(Ha). Number of one-year eligible white females screened, by age and number of lifetime screenings 224

II(Ia). Number of one-year eligible black males screened, by age and number of lifetime screenings 225

II(Ja). Number of one-year eligible black females screened, by age and number of lifetime screenings 226

II(Ka). Number of one-year eligible American Indian males screened, by age and number of lifetime screenings 227

II(La). Number of one-year eligible American Indian females screened, by age and number of lifetime screenings 228

Table		Page

II(Ma).	Number of one-year eligible Spanish-speaking males screened, by age and number of lifetime screenings	229
II(Na).	Number of one-year eligible Spanish-speaking females screened, by age and number of lifetime screenings	230
II(Oa).	Number of one-year eligible participants screened in Detroit, by number of lifetime screenings	231
II(Pa).	Number of one-year eligible participants screened in forty-four Northern Michigan counties, by number of lifetime screenings. . .	232
II(Qa).	Number of one-year eligibles screened in Detroit and Northern Michigan, by race and number of lifetime screenings	233
III(a).	Number of long-term eligibles screened in 1978, by age and number of lifetime screenings	251
III(Aa).	Number of long-term eligible whites screened in 1978, by age and number of lifetime screenings	252
III(Ba).	Number of long-term eligible blacks screened in 1978, by age and number of lifetime screenings	253
III(Ca).	Number of long-term eligible American Indians screened in 1978, by age and number of lifetime screenings	254
III(Da).	Number of long-term eligible Spanish-speaking screened in 1978, by age and number of lifetime screenings	255
III(Ea).	Number of long-term eligible males screened in 1978, by age and number of lifetime screenings	256
III(Fa).	Number of long-term eligible females screened in 1978, by age and number of lifetime screenings	257

Table		Page
III(Ga).	Number of long-term eligible white males screened in 1978, by age and number of lifetime screenings	258
III(Ha).	Number of long-term eligible white females screened in 1978, by age and number of lifetime screenings	259
III(Ia).	Number of long-term eligible black males screened in 1978, by age and number of lifetime screenings	260
III(Ja).	Number of long-term eligible black females screened in 1978, by age and number of lifetime screenings	261
III(Ka).	Number of long-term eligible American Indian males screened in 1978, by age and number of lifetime screenings	262
III(La).	Number of long-term eligible American Indian females screened in 1978, by age and number of lifetime screenings	263
III(Ma).	Number of long-term eligible Spanish-speaking males screened in 1978, by age and number of lifetime screenings	264
III(Na).	Number of long-term eligible Spanish-speaking females screened in 1978, by age and number of lifetime screenings	265
III(Oa).	Number of long-term eligible participants screened in 1978 in Detroit, by age and number of lifetime screenings	266
III(Pa).	Number of long-term eligible participants screened in 1978 in forty-four Northern Michigan counties, by number of lifetime screenings	267
IV(a).	Number of one-year eligibles screened in 1978, by age and number of lifetime screenings.	285
IV(Aa).	Number of one-year eligible whites screened in 1978, by age and number of lifetime screenings	286

Table		Page
IV(Ba).	Number of eligible blacks screened in 1978, by age and number of lifetime screenings	287
IV(Ca).	Number of one-year eligible American Indians screened in 1978, by age and number of lifetime screenings	288
IV(Da).	Number of one-year eligible Spanish-speaking screened in 1978, by age and number of lifetime screenings	289
IV(Ea).	Number of one-year eligible males screened in 1978, by age and number of lifetime screenings .	290
IV(Fa).	Number of one-year eligible females screened in 1978, by age and number of lifetime screenings	291
IV(Ga).	Number of one-year eligible white males screened in 1978, by age and number of lifetime screenings	292
IV(Ha).	Number of one-year eligible white females screened in 1978, by age and number of lifetime screenings	293
IV(Ia).	Number of one-year eligible black males screened in 1978, by age and number of lifetime screenings	294
IV(Ja).	Number of one-year eligible black females screened in 1978, by age and number of lifetime screenings	295
IV(Ka).	Number of one-year eligible American Indian males screened in 1978, by age and number of lifetime screenings	296
IV(La).	Number of one-year eligible American Indian females screened in 1978, by age and number of lifetime screenings	297
IV(Ma).	Number of one-year eligible Spanish-speaking males screened in 1978, by age and number of lifetime screenings	298

Table		Page

IV(Na). Number of one-year eligible Spanish-speaking females screened in 1978, by age and number of lifetime screening 299

IV(Oa). Number of one-year eligible participants in Detroit screened in 1978, by age and number of lifetime screenings 300

IV(Pa). Number of one-year eligible participants screened in 1978 in forty-four Northern Michigan counties, by number of lifetime screenings. 301

LIST OF FIGURES

Figure		Page
1.	Regression lines depicting the relationship between number of referrals and number of lifetime screenings for long-term eligibles, by year of last screening	145
2.	Regression lines depicting the relationship between number of referrals and number of lifetime screenings for one-year eligibles, by year of last screening	148
3.	Regression lines depicting the relationship between number of referrals and number of lifetime screenings for long-term eligibles, by year of last screening for interaction model	307
4.	Regression lines depicting the relationship between number of referrals and number of lifetime screenings for one-year eligibles, by year of last screening for interaction model	312

CHAPTER I

INTRODUCTION

This is a study to determine whether the Early and Periodic Screening, Diagnosis and Treatment (EPSDT) program benefits its participants. To that end a large volume of existing computerized health data on low income children in Michigan was analyzed using screening referral rates and treatment costs as outcome variables. Interest was in their variability as a function of program participation with the influence of demographic factors also considered. The study's importance lies in its contribution to the limited knowledge available on the effectiveness of this large, relatively new and somewhat unconventional program. EPSDT's history, strategy and clientele all make it of particular interest to those in the health and social welfare fields.

Studies have generally shown the poor to have more health problems and fewer medical resources than higher income groups. In an attempt to address this problem, EPSDT aims to increase access to medical services but access for those with identified, medical needs, not solely low income. The program's strategy is to divide its population into two groups - one seemingly without health problems; the other with possible problems and the need for services. This division is accomplished by administering a series of screening tests and procedures. Medical resources, diagnostic and treatment services, are then concentrated on those apparently most in need - those who failed the screening test(s).

Screening is a key component in the program and screening is controversial. Although it has a history in the United States dating from the 1920s, the medical community and public have only moderately accepted it. Reservations regarding its usefulness undoubtedly contributed to EPSDT's slow pace of implementation. While some believe screening makes little or no contribution to maintaining health, others, such as EPSDT advocates, argue that relatively small expenditures for screening can lessen the need to later spend much larger sums for treatment.[1] The rationale for screening has intuitive appeal. Its basic purpose is to find and treat problems early, before they advance to a more complicated state. More technically, screening attempts to shorten the time interval between problem onset and detection in order to consequently shorten the interval between treatment and recovery. Whether screening accomplishes its purpose and whether the factor of time is even important in problem detection remain topics of disagreement.

EPSDT was enacted by the United States' Congress in 1967 as an amendment to Title XIX of the Social Security Act. Its authorization marked the first time that the United States had included preventive health services in a large, national program.[2] As most programs

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[1]As examples, see Abraham B. Bergman, "The Menace of Mass Screening," American Journal of Public Health, LXVII (July, 1977), 601-02 and Gunnar B. Stickler, "How Necessary is the 'Routine Checkup'?," Clinical Practice, VI(August, 1967), 454.

[2]Morris S. Dixon, Jr., "Title XIX EPSDT: The Implications for Pediatric Practice," Bulletin of Pediatric Practice, VI (December, 1972), 2.

authorized by the Social Security Act, EPSDT is state administered but jointly funded by the federal and state governments. States are required to offer the program to recipients of the Aid to Families with Dependent Children (AFDC) program who are under age twenty-one although client participation is voluntary.

EPSDT has a large eligible population and accordingly a potential impact of far reaching dimensions. Nationally, some thirteen million young people are eligible with over half a million of these living in Michigan. In fact, it is the federal government's largest health care program for poor children and serves more Medicaid children than all other federally supported health care programs combined.[3] Those initiating the program were undoubtedly mindful of the mass constituency to be affected and the need to direct resources to this specific population.

However, despite Congressional intent and the threat to states of federal financial penalty for noncompliance, implementation proceeded slowly. The federal government did not issue final program guidelines until 1972 and most states did not offer services until several years later. All states, with the exception of Arizona which has no Title XIX (Medicaid) program, now have an EPSDT program. Michigan, site of the study, began its program in 1973.

When establishing the Michigan program, the Title XIX agency, the payer of medical services for Department of Social Services (DSS)

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[3]Department of Health, Education and Welfare: Health Care Financing Administration, EPSD&T: The Possible Dream (Washington, D.C.: Government Printing Office, 1977), cited in the Foreward.

recipients and the single state agency responsible for EPSDT, chose the Michigan Department of Public Health (DPH) to administer the screening portion of the program. The Department of Public Health in turn contracted with local health departments for actual provision of the screening services. The Department of Social Services was responsible for the outreach effort. These DSS-DPH relationships were defined by means of an interagency agreement and the program structure has remained unchanged to the present, with the exception of some local health departments assuming the outreach function.

The program flow is as follows: Eligibles are systematically contacted and asked whether they wish to participate in the program. Those who request services are scheduled for screening at a clinic staffed by specially trained EPSDT personnel. Those who decline to participate are simply recontacted at a later time, usually in one to two years. The screening is uniformly conducted by a registered nurse and technicians who administer a standard screening package. Those failing a test(s), are referred to an appropriate provider(s) with arrangements made for securing the needed referrals prior to the client leaving the screening site. That is, the clinic either obtains a referral appointment for the client or the client expresses the preference of making her/his own appointment. A link thus exists between screening and the availability of needed treatment services.

For each child screened, the results of the examination are recorded on a special form, the contents of which are subsequently entered on computer file. For those receiving referral services, as for all Medicaid eligibles receiving service, enrolled providers bill the Medicaid program for reimbursement through an automated payments system. Thus, for purposes of conducting this study, screening results, medical costs and basic client demographic information were all accessible by computer.

As indicated above, there is present in the program a factor of self selection and this factor complicates evaluative efforts. Eligibles have free choice over receipt of services. This means those wishing to participate in the program can not be denied the opportunity to do so, even for purposes of research. Client choice is considered a right. Thus, random selection and assignment of program participants is neither experimentally possible nor inherent in the program's operation. Consequently, the question arises as to whether the same factor(s) which determine program participation might not also be responsible for any differences in health status? However, as Philadelphia Health Management Corporation (PHMC) argues in their evaluation of EPSDT,[4] a counter interpretation of outcomes is feasible only if the alternative hypothesis is itself reasonable or has empirical support. For example, improved outcomes in a longitudinal design may be due either to statistical regression or experimental effects. However, if first scores of the experimental group are lower than first scores of a control group, subsequent improvement is more likely attributable to experimental effects. Similarly, if support for program effects is found in a series of tests, each of which offers different alternative hypotheses, then support for the program grows

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[4]Philadelphia Health Management Corporation, A Study of The Process, Effectiveness, and Costs of the EPSDT Program In Southeastern Pennsylvania, Part III, (Philadelphia, Pennsylvania), 1980.

at the expense of rival explanations. These are the types of situations PHMC deliberately constructs in their study and it is their conclusion that self selection does not compromise their findings.[5] In short, the lack of random selection does not necessarily invalidate a study and there is some empirical as well as theoretical evidence to support this view.

Also, of relevance to the issue of self selection is a comparison of EPSDT participants and nonparticipants. Approximately 50% of Michigan EPSDT eligibles are participants, i.e. they have been screened at least one time.[6] This is a reasonably good participation rate and would seem to suggest that participants and nonparticipants are not extremely different. Age does show some variation between the two groups:

Reference Table 1. Percent of eligibles and percent of eligibles screened by age.

Age	Percent of Eligibles Screened[7]	Percent of EPSDT Eligibles[8]
0-5	42%	37%
6-12	37%	39.7%
13-20	21%	23.3%

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[5] Ibid., p. 92, -. 103.

[6] Michigan Department of Social Services, Health and Welfare Data Center, "Eligibility Statistics By County, Report Number EP-293," (Lansing, Michigan). For January, 1981 there were 554,578 EPSDT eligibles, 278,840 (50%) of whom had been screened at least one time. For September, 1979, there were 485,048 eligibles, 240,455 (49.5%) of whom had been screened at least once.

[7] Michigan Department of Public Health and Michigan Department of Social Services, EPSDT Michigan Annual Report, 1978, (Lansing, Michigan), 1979, 10.

[8] Michigan Department of Social Services, Assistance Payments Statistics, Publication No. 67, Data Reporting Section, (Lansing, Michigan), February, 1980, 29.

This table shows some tendency for younger children to participate disproportionately in the program. This likely indicates greater parental concern for the health of younger children as well as the more influential voice of older children in determining the uses of their time.[9]

Further review of Michigan program statistics suggests differences, although not extreme ones, do exist between EPSDT participants and nonparticipants:[10] Participation by sex is comparable for all age groups, excepting those 13-21 years old. For this group, 59% of those screened were female; 41% male, a striking difference. Urban-rural differences appear to play some role in distinguishing users. During 1978, the ratio of screenings to the use of Medicaid services was 15% higher in rural areas. It was thought this difference reflected the greater availability of medical services in the urban areas. Surprisingly, good comparative data on race are not available. During 1978, 57% of screenees were white, 38% were black, 4% Spanish-Speaking, .3% American Indian and 1% "other." This distribution is similar to the racial composition of those using Medicaid services, but since data are not available on the racial composition of the eligible population, a strict comparision of EPSDT participants and nonparticipants is not possible. In summary, differences between participants and nonparticipants exist but are not

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[9]Although the data displayed are from somewhat different time periods, since the number of eligibles involved is large (106,455 screened and 430,120 eligible), sizable shifts in age distribution would not be expected to occur in a twelve to eighteen month period.

[10]Michigan Department of Public Health and Michigan Department of Social Services, EPSDT Michigan Annual Report, 1978, op. cit., p. 11-13.

extreme. Those participating in EPSDT tend to be somewhat younger and more rural than EPSDT eligibles in general and, if a teenager, half again as likely to be female as male.

With unlimited resources, a different research design would have been preferable. Since the program's central purpose is to improve the health status of children, the ideal study might perform longitudinal medical examinations on equated samples of program participants and nonparticipants. The medical tests and procedures used would be determined by a panel of medical experts. The study would continue for many years since effects might not be manifest until far in the future. However, a study of this magnitude was far beyond the writer's resources. Medical personnel were not available to conduct examinations and related tests. Nor was a long-term study desired. However, as noted, results of screening tests had been retained on computer files for virtually the program's entire history in Michigan and recent medical cost data were also available. Once arrangements were made to access and analyze these data, a study was possible which used a valid and feasible research design although not an ideal one.

Program evaluation is part of program administration. This is not to say that the products of evaluation are a pressing, daily need or that evaluation can maintain itself as a priority in the face of day-to-day operational and crisis-centered demands. However, as coordinator of the EPSDT program for nearly its entire history in Michigan, the writer is well aware of the need to establish an empirically based defense of social programs. During the

1970s, the writer observed that an ongoing administrative task was to structure and secure resources for the program, a task which necessitated selling it at various administrative levels within the state public welfare system. This situation likely prevailed in other states. At the same time the federal government was in the position of selling the program to states so that states would implement the program. In the late 1970s, the federal government attempted to persuade Congress to expand the program via new legislation. In all these situations, the case for EPSDT was ultimately argued on the very basic level of "does it do any good?" and "is it really needed?" Obviously, empirical knowledge concerning the program's effect on health status and medical costs was needed to answer these questions and thereby administer the program.

The fact that program implementation moved slowly and that Congress did not pass new legislation reflects, at least in part, unsatisfactory answers to basic questions of outcome. In the 1980s, it appears these same answers will be needed to maintain the existing program or, at a minimum, to slow its retrenchment. These circumstances, plus the general public concern over the contributions of social programs and the increasing need to distribute the poor's diminishing allocation of resources to areas of maximum benefit, all created impetus for undertaking the following study.

This dissertation presents, in Chapter II, a review of literature which serves to place the study in the context of the program's history, theory and past findings of outcomes. Chapter III explains the study's research design and methodology and discusses the modes of quantitative analysis used, including the statistical tests employed and the reasons for their selection. Chapter IV presents the findings while Chapter V addresses their implications and summarizes the entire study. The obtained data are presented in tables located in either the body of the study or in the Appendices.

CHAPTER II

REVIEW OF LITERATURE

This chapter will summarize literature selected for the purpose of placing this study in the context of other thought and research relevant to this investigation. The literature will be reviewed under the following four headings respectively: (1) Background on EPSDT, (2) Outcome studies on non EPSDT screening programs, (3) Outcome studies of the EPSDT program and (4) The relationship of demographic factors to health status.

Background on EPSDT

The aim of this section is to develop a better understanding of the EPSDT program through a survey of its early history with particular attention given to uncovering the program's original purpose(s). Why was it conceived and what was it intended to accomplish? Answers to such questions would help to not only deepen understanding but also to determine whether the program is functioning as intended. Unfortunately, but perhaps not surprisingly, answers to such basic questions are not completely clear.

Foltz, through a series of articles,[1] has likely established herself as EPSDT's principal historian. The best single source in

[1]Anne-Marie Foltz, "The Development of Ambiguous Federal Policy: Early and Periodic Screening, Diagnosis and Treatment (EPSDT)," Milbank Memorial Fund Quarterly/Health and Society, LIII (Winter, 1975), 35-64; Anne-Marie Foltz, Uncertainties of Federal Child Health Policies: Impact In Two States (New Haven, CT: Yale University,

this series is "The Development of Ambiguous Federal Policy: Early and Periodic Screening, Diagnosis and Treatment (EPSDT)." This article is a detailed history of the program's beginnings, its legislative history and subsequent lengthy development as a regulation by the Department of Health, Education and Welfare (HEW, now the Department of Health and Human Services, or HHS). It is relied on heavily in what follows.

Foltz traces federal support of health screening, at least implicit support, to 1935 and two sections of Title V of the Social Security Act. One section established a Crippled Children's program, the purpose of which was to locate and treat crippled children. Title V also established Maternal and Child Health services which many states used to support well-child conferences emphasizing preventive care and screening. Some states and localities had established well-child conferences (examinations) for limited numbers of children during the 1920s. Title V strengthened these initiatives and the program continues today.

Between 1935 and the 1960s, little innovation occurred in federal child health policies. During World War II, well-child conferences were expanded and the Emergency Maternity and Infant Care Program (EMIC) was initiated whereby states received funds to provide preventive and treatment services to wives and children of lower paid military personnel. Foltz says EMIC was successful but was terminated

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Department of Epidemiology and Public Health, 1978); Anne-Marie Foltz and Donna Brown, Health Policy Project: The Impact of Federal Child Health Policy under EPSDT - The Case of Connecticut (New Haven, CT: Yale University Department of Epidemiology and Public Health, 1975; Anne-Marie Foltz and Donna Brown, "State Response to Federal Policy: Children, EPSDT, and the Medicaid Muddle," Medical Care, XIII (August, 1975), 630-42.

after the war.[2]

The 1960s saw an unprecedented number of initiatives in public programs, including child health. Foltz notes the major activities: Title V was expanded through Maternity and Infant Care Projects (1963) providing comprehensive maternity and infant care and through Children and Youth Projects (1965) which provided comprehensive health services for children and youth in selected geographic areas. The Economic Opportunity Act (1964) resulted in the establishment of neighborhood health centers and the head start program. Medicaid was authorized (1966) which, although not a children's program, would finance billions of dollars of medical services for children. Federal programs of this scope and number had never before been attempted. It was within this social climate that EPSDT was conceived; only one of many social programs undertaken in this rare period of national history when resources and attention were shifted somewhat to those of the lower class.

The ultimate reasons for establishing EPSDT are surely the same reasons for this overall expansion of public services for the poor during the 1960s. Precisely why the United States undertook this brief period of social experimentation is a matter of some debate, which although germane, is beyond the purview of this study to resolve.[3] However, there are available, specific references to EPSDT's origin

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[2]Ann-Marie Foltz, "The Development of Ambiguous Federal Policy: Early and Periodic Screening, Diagnosis and Treatment," op cit., p. 37.

[3]For a sample of the debate see Peter Marris and Martin Rein, Dilemmas Of Social Reform (New York: Atherton Press, 1969); Daniel P. Moynihan, Maximum Feasible Misunderstanding (New York: The Free Press, 1969) and Frances Fox Piven and Richard A. Cloward, Regulating the Poor: The Functions of Public Welfare (New York: Pantheon, 1971).

which are worthy of mention.

Shenkin says, "In common with almost all legislation in this era of social program expansion, the EPSDT proposal arose from the executive branch. . . ."[4] However, both Shenkin and Foltz agree EPSDT's theoreticians and core of advocates were within HEW. Shenkin again: ". . . HEW housed the real proponents of EPSDT. . . . It was specific perceptions and goals within HEW that led to EPSDT."[5] More specifically, Foltz cites what is apparently the earliest written conceptualization of EPSDT: "The idea for federally sponsored periodic screening for low-income children first appeared in 1966 in a program analysis prepared in the Secretary's Office of HEW."[6] An HEW publication has also credited the Program Analysis as resulting in the "creation of EPSDT."[7] The analysis was unpublished but because of the insight it gives to the early concept and rationale for the program, references to it are worth reviewing.

Foltz says the 1966 Program Analysis outlined three alternative programs, with price tags, which would involve screening and treating low-income children. It buttressed the case for EPSDT by including

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[4]Budd N. Shenkin, M.D., "Politics and the Health of Children, Medical Care, XIV (October, 1976), 884.

[5]Ibid., p. 884

[6]Ann-Marie Foltz, "The Development of Ambiguous Federal Policy: Early and Periodic Screening, Diagnosis and Treatment (EPSDT)," op cit., p. 41. Also, Foltz states elsewhere, "The idea of EPSDT seems first to have germinated within HEW in the 1966 Program Analysis, . . ." in Anne-Marie Foltz, "Rebuttal to Dr. Shenkin," Medical Care, XIV (October, 1976), 886.

[7]Department of Health, Education, and Welfare: Health Care Financing Administration, EPSD&T: The Possible Dream, op. cit., p. 1.

a Selective Service study which indicated a significant percentage of draftees were being rejected because of physical and mental problems which could have been corrected if identified and treated at an earlier age. "It was to deal with these problems early - and cost effectively - that EPSDT was established."[8]

It appears the interest in correcting these problems was prompted by a mix of considerations. Monetary motivations were apparently present, or at least were used as a supportive argument for the program. Foltz says, "The case finding was to lift a burden from the population by saving children from handicapping conditions."[9] Elsewhere she noted the analysis argued for saving society money by preventing defects.[10] The HEW brochure "The Status of EPSD&T" says the "immediate reason" for EPSDT is to provide poor children access to health care because they need it but it also notes that another reason is to save the public money by preventing medically-induced dependency.[11] This dual theme is also present in another HEW publication which prominently stresses the need to address the health problems of poor children but also notes that "Evidence of the program's cost-effectiveness is already beginning to come in."[12] HEW also argues:

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[8]Children's Defense Fund, EPSDT: Does It Spell Health Care For Poor Children? (Washington, D.C.: Washington Research Project, Inc., 1977), p. 25

[9]Anne-Marie Foltz, "The Development of Federal Policy: Early and Periodic Screening, Diagnosis and Treatment (EPSDT," op. cit., p. 41.

[10]Anne-Marie Foltz, "Rebuttal to Dr. Shenkin," op. cit., p. 887.

[11]Department of Health, Education, and Welfare, "The Status of EPSDT," (SRS, 75-02052) (Washington, D.C.: Government Printing Office, 1975).

[12]Department of Health, Education, and Welfare: Health Care Financing Administration, EPSD&T: The Possible Dream, op. cit., p. 16.

> By preventing acute illness and reducing the need for expensive institutional care, preventive programs like EPSDT represent the long-term advantages of removing from the State the fiscal burden of caring for severely handicapped people, as well as improving the quality of life for those individuals whose health future is protected.[13]

The frequently mentioned purpose of cost reduction is of particular interest to this study since costs is one of the two outcome variables which will be measured. It is clear the poor's medical costs are of interest and importance whether viewed as reflecting their quality of life or financial burden to the larger society.

The Program Analysis was circulated in late 1966, on February 8, 1967 President Johnson referenced the EPSDT concept in an address to Congress and on February 16, 1967 Representative Wilbur Mills introduced a broad-ranging legislative package which included EPSDT. Mills' proposed legislation, the Social Security Amendments of 1967, consumed 112 pages, three paragraphs of which concerned EPSDT.[14]

According to Foltz the program remained inconspicuous in subsequent legislative hearings, evoking little comment. She says the silence was damaging. Her thesis is that Congress was ambiguous on key provisions of the bill - its costs, scope of services, eligible population and administration - and these ambiguities hampered later program acceptance and implementation.[15] However, both Foltz and

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[13] Ibid., p. 17.

[14] Anne-Marie Foltz, "The Development of Ambiguous Federal Policy: Early and Periodic Screening, Diagnosis and Treatment (EPSDT)," op cit., p. 49.

[15] Ibid., pp. 35-64 and Anne-Marie Foltz, "Rebuttal to Dr. Shenkin," op. cit., pp. 886-87.

Shenkin realize these omissions were by design. "Congress felt that general directions could be given to the Administration, and the specifics could be worked out in good faith."[16] And, (For HEW) " . . . ambiguity was seen as flexibility; congressional passage was seen as enabling legislation to them to get their agencies going."[17] The idea was to get programs started and work out the details later. Ideally, this is not planning and not the way to legislate national health policies; pragmatically, it is the quicker appearing and perhaps the only way to get programs established. Of course herein lies the dilemma:

> It may be true that no politician can sell an expensive health program to his constituents, but unrealistic costing leads to a public that may become increasingly disenchanted with federal health programs which cannot live up to the expectation placed on them by Congressional and Executive rhetoric.18

Assuming Foltz is correct, EPSDT evaluation is especially warranted to learn whether the program is meeting its original expectations and, if so, to thereby empirically strengthen the program's reasons for existence.

The Social Security Amendments of 1967 (PL 90-248), including EPSDT, passed both houses after an eight-month legislative history and were signed into law on January 2, 1968. The law called for program implementation by July 1, 1969 but it was not until June, 1972, four and a half years after legislative authorization, that HEW issued final

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[16] Budd N. Shenkin, M.D., "Politics and the Health of Children," op. cit., p. 885.

[17] Ibid., p. 884.

[18] Anne-Marie Foltz, "The Development of Federal Policy: Early and Periodic Screening, Diagnosis and Treatment (EPSDT)," op. cit., p. 60.

program regulations and guidelines. Even then, states were given until July 1, 1973 to implement the program for all age groups.

The long delay which followed legislative passage was apparently the result of HEW attempts to resolve at least some of the program's legislated ambiguities prior to implementation.[19] For example, as mentioned, the law actually assigned EPSDT to two existing programs, Title XIX - a welfare program and Title V - a health program. What was the relationship to be between these two programs and their agencies? Which was responsible for EPSDT? According to Foltz, HEW became a "battleground" as various groups lobbied and advocated for their version of the program.[20] The controversies, avoided in legislative passage, erupted at the stage of fashioning regulations. Welfare and health agency representatives from both the state and national level were involved as was the National Welfare Rights Organization (NWRO), child health advocates, Congress and HEW's program proponents. Each had their own vision for the program. States were particularly influential and, fearing program costs, were the main factor causing the delay in implementation according to Foltz.[21] During this period EPSDT was considerably shaped although many of the original contentions were not resolved and still remain, particularly the issue of state versus national program control and concerns regarding program cost and impact.

A key personality in this formative stage for the program was Wilbur Cohen, then HEW Secretary and long-time University of Michigan

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[19] _Ibid._, pp. 50-58

[20] _Ibid._, p. 50

[21] _Ibid._, p. 55.

administrator. As Secretary, Cohen had ultimate responsibility for promulgating the program's regulations and guidelines and his decisions were crucial. For example, Cohen resolved the issue of administrative responsibility for the program by simply asking Title XIX, but not Title V, to develop program regulations. Cohen did this even though the legislation called for EPSDT regulations in both programs. (An in depth study of Cohen's role in EPSDT would likely be very helpful for understanding the program's early history.)

Even with issuance of final regulations in 1972 and Congressional passage in that same year of a penalty provision for states with deficient programs, implementation still moved slowly, or not at all, in most states. This prompted legal aid attorneys in many states to initiate class action suits to get the program started. Peterson is a good source for recounting these initiatives. Generally they were very successful and resulted in many states beginning their programs in 1973-74 under court order to do so.[22] Michigan implemented its program within three months of a January, 1973 United States district court order requiring implementation. And, once begun, state programs continued to become accepted as a standard, yet unique, Medicaid benefit. Nonetheless, even though implemented, programs developed rather slowly as well as differently across states. The period since 1973-74 might well be considered as a "start up" phase for the program, one in which it became institutionalized. Dramatic changes did not occur;

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[22]Eric Peterson, "Legal Challenges to Bureaucratic Discretion: The Influence of Lawsuits on the Implementation of EPSDT. Health Policy Project Working Paper No. 27," (New Haven: Yale University, 1975).

but the program did operate, children did participate and this participation either did, or did not, have an effect on the recipients of service.

Several characteristics of the Michigan program are worth noting in this context as they support the choice of the state as a study site: Once implemented, the Michigan program quickly began screening large numbers of children and by late 1975 had screened a quarter million youngsters.[23] Currier says that by October, 1976 Michigan had done 10% of all EPSDT screenings done thus far in the United States.[24] The Michigan program has continued to screen over 100,000 children per year and this substantial participation rate, plus the existence of a quite heterogeneous population in terms of racial and urban/rural mixture, make Michigan a good state in which to study the program.

In summary, review of EPSDT's origins and history reveals a program conceived and quickly legislated at the national level but one which has experienced a slow pace of actual implementation. Its original purposes were apparently several: increase access to medical services for those in need with the expectation that participants' health status will be subsequently improved and medical costs reduced. Before reviewing studies which address how well the program is meeting its expectations, mention should be made that a considerable body of "program literature" has been published, much of it by the federal

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[23]Thomas R. Kirk, M.D., et al., "EPSDT - One Quarter Million Screenings in Michigan," Public Health Briefs, LXVI (May, 1976), 492-84.

[24]Richard Currier, MA, "Is Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) Worthwhile?," Public Health Reports, XCII (November-December, 1977), 527-36.

government, which basically provides information of an operational or "how-to-do-it" nature. An excellent guide to this literature is the recently published EPSDT: A Selected Annotated Bibliography, which lists over one hundred EPSDT articles and reports.[25] While this literature is not directly relevant to purposes of this study, and accordingly will not be reviewed here, it does provide a deeper and more comprehensive understanding of the program and of course is of interest to program personnel since it constitutes the program's "technical literature."

Outcome Studies of NonEPSDT Screening Programs

Multiphasic screening programs and the physical examination are of interest relative to the EPSDT program since they are screening activities. While they may differ in specifics such as scope of testing or type of test administrator, their basic purpose is identical to EPSDT's - shorten the time interval between onset and detection of medical problems and thereby expedite recovery. In evaluating their effectiveness a number of studies have used mortality rates as the outcome variable.

Studies of Mortality Rates

In the early 1920s, Knight identified the number of deaths occurring to some 6000 holders of ordinary life insurance who had volunteered to receive free periodic examinations between 1914 and 1915. Five and one half years after the examinations, actual deaths totaled 217 among this

[25]United States Department of Health and Human Services, Health Care Financing Administration, EPSDT: A Selected Annotated Bibliography, (Washington, D.C.: Government Printing Office, 1980).

group compared with an expected figure of 303 deaths. Knight attributed the 28% reduction in mortality to the examinations and estimated the resulting monetary value to the company totaled more than $126,000 for a cost of about $40,000. He gave no information about the medical care received by those screened or those not screened.[26]

More recently, Thorner and Crumpacker reported that the mortality rate of executives who participated in a periodic health examination was less than the rate of the general population of white males in the United States. The authors felt this difference was most likely due to the higher socio-economic level of those examined and the generally better level of medical care available to them.[27]

Roberts, et al. studied mortality rates for 20,648 men, mostly white executives, who had received employer-sponsored examinations in the northeastern United States between 1950 and 1964. Their mortality rate was compared with the rates of white males in the general population; white, professional males; and two groups of white males receiving certain special classes of life insurance. The study group had a lower mortality rate than three of the comparison groups and a rate equal to "preferred-risk males" receiving premium life insurance. Because the selection process for the latter group excluded those with certain defects and diseases (not similarly excluded from the study group), Roberts considered it noteworthy that the study group did as well as, not worse

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[26]A.S. Knight, "Value of Periodic Medical Examination," Statistical Bulletin of Metropolitan Life Insurance Company, 2:1 1921 cited in Norbert J. Roberts, et al., "Mortality Among Males In Periodic-Health-Examination Programs," The New England Journal of Medicine, CCLXXXI (July, 1969), 20.

[27]Robert M. Thorner and E. L. Crumpacker, "Mortality and Periodic Examinations of Executives," Archives Of Environmental Health, III (July-December, 1961).

than, this select group. However, he was not willing to attribute the lower mortality rate to receipt of the examinations, noting that a self selection process was operative for those receiving examinations and that this might have affected outcomes. Roberts did not identify what, if any, measures were undertaken to insure treatment for those determined by the screening to be in need of service.[28]

The Commission of Chronic Illiness (CCI) conducted a multiphasic screening clinic in Baltimore as part of a 1954 morbidity survey. Five years later Wylie found no difference in the mortality rates of those screened and those who refused screening and concluded there was no basis for believing participants had benefitted from screening.[29] However, a twelve year follow-up by Kuller and Tonascia disclosed that those screened, and especially the white females who were screened, had a better survivorship than those who refused screening. These differences were apparently unrelated to variations in history of chronic disease or disability at entry to the study. However, because self selection was operative in the CCI study, Kuller and Tomascia concluded the selection bias for screening could itself account for the difference in outcome and definitive conclusions regarding the value of screening were not possible.[30]

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[28] Norbert J. Roberts, op. cit., pp. 20-24.

[29] C. M. Wylie, "Participation in Multiple Screening Clinic With Five-Year Followup," Public Health Report, LXXVI (July, 1961), 596-602.

[30] Lewis Kuller and Susan Tonascia, "Commission of Chronic Illness Follow-Up Study: Comparison of Screened and Nonscreened Individuals," Archives Of Environmental Health, XXI (November, 1970), 656-65.

CCI apparently did not follow up to insure that needed treatments were received. Thus, as in other studies where treatment services are not linked to screening failures, it is not known to what extent those screened and found to be in need of treatment received any service other than the screening itself.

In yet another study concerned with mortality rates, Gordon analyzed an epidemiological study of heart disease which randomly selected 6507 persons for examinations and actually examined 68.8% of these. The mortality rates for two years subsequent to screening were twice as high for the unscreened group as for the screened group. While the study made no effort to assure treatment for detected problems, examination findings were available to the physician.[31]

In all the cited mortality studies, a methodological problem has been the presence of a self selection factor in sorting out those requesting examinations for those refusing examinations. Enterline and Kordan had a unique opportunity to get around this problem and to approximate a controlled study. They compared mortality rates for two groups of persons who participated in chest x-ray surveys in Texas and California. Screening was done for heart disease and tuberculosis. With one group, problems were identified immediately upon the initial reading of the photo-fluorograms and were referred for diagnosis. The second group consisted of those who had a problem at the time of screening but their film was misread. Consequently, they were not referred until several years later following a second reading of the same

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[31]Tavia Gordon, et al., "Some Methodological Problems in the Long-Term Study of Cardiovascular Disease: Observations on the Framingham Study," <u>Journal of Chronic Diseases</u>, X (September, 1959), 186-206.

film. The group identified at the first reading had a better survival rate.[32]

In summary, several commonalities are present in the mortality rate studies. Outcome differences favoring program participants were quite consistently obtained. However, generally loose research methodologies were equally evident and thereby jeopardize the findings. One pervasive concern is the virtually unavoidable self selection factor. This caused several researchers to be cautious in their conclusions although it was controlled for Enterline and Kordan whose results supported the trend of findings. Secondly, programs apparently did not ensure that treatment services would be available for those whose screening results indicated a referral need. Clearly, screening by itself will not contribute to improved health. If screening were the sole service received in the mortality studies, it is not reasonable to credit the program with differences in outcome. A third general qualification regards the use of death rates as the sole determinant of program effectiveness. This indicator is much too specific, being insensitive to many changes which are important but are not of a life or death magnitude. Obviously, many meaningful and interesting changes occur in health status which this indicator can not measure.

Studies By Health Maintenance Organizations

As prepaid health care plans, HMOs have a structured incentive to minimize costs. If unplanned, and therefore unbudgeted, costs occur

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[32]Philip E. Enterline and Bernard Kordan, "Controlled Evaluation of Mass Surveys for Tuberculosis and Hearth Disease," Public Health Reports, LXXIII (October, 1958), 867-875.

they must be absorbed by the HMO rather than being passed on to the consumer or third party payee as is done in the traditional health care system. Thus, it is not surprising some HMOs have shown major interest in using and researching health screening.

The Health Insurance Plan of New York (HIP) was one of the earliest prepaid medical plans in the United States. In the late 1960s, HIP conducted a large scale study involving two random samples, each consisting of 31,000 women. The women were ages 40-64 and all HIP members. The study was concerned with mammography and clinical examination of the breast. The study group was recruited for screening examinations while the controls followed their usual medical practices. 65% of the study group received the initial screening and a large percentage of these received subsequent rescreenings. After five years of follow up, the study group had about a 1/3 lower mortality rate from breast cancer than did the control group. However, this reduction in breast cancer was inexplicably found only for those at ages over 50 and not at ages 40-49.[33]

The Kaiser-Permanente Medical Care Program of California is likely the best known prepaid health care plan (HMO) in the United States. In 1964 they undertook a controlled, longitudinal study to evaluate the effectiveness of periodic health examinations. Two samples were randomly selected from their population of enrollees with each sample having approximately 5000 persons, age 35-54. The study group was urged to undergo an annual examination and approximately 65% did so. The

[33]Sam Shapiro, "Evaluation of Two Contrasting Types of Screening Programs," <u>Preventive Medicine</u>, II (June, 1973), 266-277.

comparison group was not so encouraged and sought medical care on their own initiative within the Kaiser program. However, approximately20-40% of the comparison group sought examinations each year without urging and by the end of seven years, 52.8% had received at least one examination.[34] Several Kaiser researchers have reported study findings.

Ramcharan et al. analyzed self reports made by study and control groups who completed questionnaires mailed to them biennially. After five to seven years of examinations, older study males (age 45-54 at entry to study) had: (a) a reduction in self-rated disability and reported time loss from work, (2) a greater proportion working and (3) a lower self-reported utilization of medical services by the sick. However, no differences were reported on any of these variables for younger females and younger males. Why these age-sex differences occurred is not known. The older study males did not report the presence of fewer chronic conditions. Thus, the incidence of these conditions may not be reduced but it may be better controlled as evidenced by the older study men reporting less disability and lower utilization of health services.[35]

Indicators reported by Dales et al. disclosed fewer differences between the study and control groups. Outpatient utilization for the physician and laboratory tests was quite similar although the study

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[34]John L. Cutler, et al., "Multiphasic Checkup Evaluation Study. 1. Methods and Population," Preventive Medicine, II (June, 1973), 199-206.

[35]Savitri Ramcharan, et al., "Multiphasic Checkup Evaluation Study: 2. Disability and Chronic Disease After Seven Years of Multiphasic Health Checkuups," Preventive Medicine, II (June, 1973).

group had more diagnoses for 26 of 188 specific diagnoses ($p \leq .05$). The reverse was not found for any diagnosis. This difference likely occurred because the study group had more multiphasic checkups. The number of hospitalizations also did not differ appreciably between the two groups with the exception that older study women, and to a lesser extent younger women, were hospitalized more. The authors thought these hospitalizations may have been for preventive-therapeutic reasons rather than a result of advanced disease since most were for surgery and gynecology service. In comparing mortality rates, no major differences was found in overall rate but for "potentially postponable" causes of death (certain cancers, hypertension, intracranial hemmorrhages), the control group rate was twice the study group rate ($p < .05$). Most of this difference was due to colon and rectal cancer and hypertensive associated causes. Dales suggested this difference might have been due to the study group's receipt of screening and subsequent followup since significantly more cases of hypertension and benign growths of the colon were diagnosed in outpatient clinics. In addition, prescription dispersal for antihypertensive agents was found to be higher for the study group.[36]

In a cost-benefit analysis of the screening program, Collen et al. concluded that over a seven year period of time a net saving of some $800 per man (for men age 45-54 at entry) could be attributed to the screening program. The difference primarily reflected the lower disability and mortality rates which enabled the men to work

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[36]Loring G. Dales, et al., "Multiphasic Checkup Evaluation Study. 3. Outpatient Clinic Utilization, Hospitalization, and Mortality Experience After 7 Years," Preventive Medicine, II (June, 1973) 221-235.

more and longer and consequently to earn more income. Similar differences were not demonstrated for younger men or for women.[37]

Findings from the HMO studies are thus mixed. While differences favoring program participants were found, they were not consistently obtained, varying frequently by age and sex for unknown reasons. However, both the Kaiser and HIP studies had complications which would serve to underestimate true differences. As noted, the Kaiser study had a sizable crossover on the screening factor (slightly more than one-half of the controls were eventually screened) while in the HIP study only two-thirds of the study group was screened. As a result, the obtained outcomes, while not strongly supportive of the program variable, do give positive indications of program effect although overall they must be considered inconclusive.

Outcome Studies of the EPSDT Program

Two general approaches have been used in an attempt to evaluate the influence of EPSDT on child health patterns. One approach has compared cost and utilization rates for screened and unscreened eligibles. The general assumption is that these indicators might be initially higher for those screened (because of resulting referral needs) but on a longer term basis they should be lower. The second strategy has compared what are essentially referral rates for initial and repeat screenings. The hypothesis is that referral rates should be lower for those rescreened which would be considered indicative

[37]Morris F. Collen, et al., "Multiphasic Checkup Evaluation Study: 4. Preliminary Cost Benefit Analysis for Middle-Aged Men," Preventive Medicine, II (June, 1973), 236-246.

of better health. Review of these studies follows.

The Community Health Foundation (CHF) compared cost and service utilization data for screened and unscreened eligibles in two North Dakota communities.[38] Diagnosis and treatment data was gathered from the Medicaid claims file for a one year period. It was apparently during this same interval that the test group received their screening. 410 children screened in Minot were compared with 1662 unscreened children in Minot and 1920 unscreened children in Bismarck. Results are given below:

Utilization Differences

1. Those screened used 21 to 30 percent fewer inpatient hospital services.[39]

2. Those screened used more services in the physician (103%-178%), dental (65%-79%) and outpatient hospital (24%) categories.

Cost Differences

1. Total per capita expenditures (including screening costs) were 36-44% lower for the screened group.

2. Per capita expenditures for inpatient hospital services were 47-58% lower for those screened.

3. Per capita expenditures for pharmaceuticals were 18 to 21% lower for those screened.

4. Per capita expenditures for physician services were 6 to 65% higher for the screened group.

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[38] Community Health Foundation, "Cost Impact Study Of The North Dakota EPSDT Program," (Evanston, Illinois: Community Health Foundation, 1977). (Mimeographed.)

[39] In this example, and for those which follow, the first percentage represents the difference between those screened and those not screened in the test (Minot) community. The second percentage represents the difference between those screened and those not screened in the control (Bismarck) community.

5. Per capita expenditures for dental services were 17% higher for those screened than for those not screened in Minot (the test community). However, these expenditures were 2% lower for the screened persons than for unscreened persons in Bismarck (the control community).

6. Per capita optical expenditures were 71% higher for those screened than for those not screened in the test community but 3% lower for the screened persons than for the unscreened persons in the control community.

This study appears to show the desired relationship between participation in EPSDT, appropriate participation in the health care system and improved health. Those screened used fewer inpatient services, more ambulatory services and incurred lower medical costs than those not screened. Utilization and expenditure patterns generally moved in the same direction. However, the CHF cautioned that the obtained relationship was not necessarily one of cause and effect because the self selection process might have resulted in children who were initially more healthy being the ones who were screened. Also, it seems unlikely that the program is sufficiently powerful to reduce inpatient hospital services by 20-30% within only one year.

A second study concerned with cost utilization was done by Applied Management Sciences (AMS).[40] AMS selected 800 screened and 800 unscreened children from each of two states and examined the Medicaid claims file for the year prior to screening, the screening year itself and the year after screening. Selected findings are displayed in the following two tables:

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[40] Applied Management Sciences, Assessment of EPSDT Practices and Costs - Report on the Cost Impact of the EPSDT Program (Silver Spring, Maryland: Applied Management Sciences, 1976).

Reference Table II. Per capita service utilization for all services by year of service and state.

Year	State 1 EPSDT	State 1 NonEPSDT	State 2 EPSDT	State 2 NonEPSDT
1974	5.86**	8.03**	10.65*	12.64*
1975	10.70	10.17	14.05	14.92
1976	7.58**	9.26**	14.04	15.36

*Difference between EPSDT and nonEPSDT sample is statistically significant at the .05 level.

**Difference between EPSDT and nonEPSDT sample is statistically significant at the .01 level.

In state 1 (southern and rural) utilization increased 29 percent for the screened group and 15 percent for those not screened from 1974 to 1976. AMS argued that if the screened group had experienced the same rate of change as the unscreened group, their utilization would have increased to only 6.74 rather than 7.58 services. The .84 units of additional utilization (nearly one visit) is about a 12% improvement attributable to the EPSDT program. Similar reasoning with state 2 (northern and industrial) data shows utilization increased 8.5 percent above what it would have in the absence of the program.

Reference Table III. Per capita costs for all services by year of service and state.

Year	State 1 EPSDT	State 1 NonEPSDT	State 2 EPSDT	State 2 NonEPSDT
1974	$85.30**	$115.25**	$146.94**	$196.36**
1975	$153.04	$143.53	$198.07*	$254.75*
1976	$117.27	$129.39	$216.98	$243.01

*Difference between EPSDT and nonEPSDT sample is statistically significant at the .05 level.

*Difference between EPSDT and nonEPSDT sample is statistically significant at the 0.1 level.

In state 1 costs increased 12% between 1974 and 1976 for EPSDT non-participants. Applying this rate of change to the screened group suggests their 1976 costs would have totaled $85.53 without program participation. The actual change to $117.27 was equal to a 23% increase attributable to the program ($117.27 - $85.53/$85.53 or $21.74 per person). The comparable changes in state 2 were 19 percent and $35.13 per person.

In summary, <u>rates of change</u> for both service utilization and costs increased more rapidly for the screened group in both states although their <u>levels of cost</u> remained lower with the exception of the screening year itself in the rural state. The increases in usage suggested that EPSDT could improve, at least temporarily, access to health services for poor children and that the increased costs resulting from the program did not appear to pose a substantial burden to Medicaid. At the same time, the AMS study did not demonstrate any short-run cost savings associated with the EPSDT program.

The second type of approach for estimating EPSDT's impact on health is demonstrated by Currier's differential analysis of referral rates.[41] He found that during the first half of 1976, 62% of those initially screened were referred as compared with a 49% referral rate for those rescreened. This is a 21% reduction in referrals. A similar Michigan review for calendar year 1977 showed these rates to be 62% and 51% respectively (an 18% reduction).[42] These data suggest that increased

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[41]Richard Currier, "Is Early and Periodic Screening Diagnosis and Treatment (EPSDT) Worthwhile?," <u>Public Health Reports</u>, XCII (November-December, 1977), 527-36.

[42]Michigan Department of Public Health and Michigan Department of Social Services, <u>Health Screening: A Call To A Better Life, Michigan Annual Report, 1977</u>, (Lansing, Michigan, 1978).

contact with the program, as evidenced by rescreening participation, results in fewer health problems. This is what the program is supposed to accomplish.

A technically sophisticated EPSDT outcome study was recently completed by Philadelphia Health Management Corporation (PHMC), an EPSDT screening provider in Pennsylvania.[43] They also analyzed health data already stored on computer file but added several procedural techniques for the purpose of protecting the study's "internal validity." The advantages they note for using already obtained data are significant, namely unobtrusiveness and not adding to service costs through primary data collection. Direct service workers and clients are usually either unable or unwilling to assist research projects and paying for their assistance becomes expensive. Thus, not only are the PHMC findings important but the methodological adjustments they made are of interest for their contributions in strengthening the "ex post facto" mode of data analysis. PHMC assessed outcomes in outreach, risk identification and, of particular relevance to this study, risk reduction.

Risk reduction was measured by the change in the "health status index" (or "abnormality rate"[44]) which equaled:

$$HS = \frac{ATA}{TTA-NA}$$

where:

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[43]Philadelphia Health Management Corporation, A Study of the Process, Effectiveness, and Costs of the EPSDT Program In Southeastern Pennsylvania, Part III, (Philadelphia, Pennsylvania), 1980.

[44]The "abnormality rate" is simply a subset of the health status index where analysis is focused on some, rather than all, of the test areas.

HS = health status index;

ATA = total number of abnormal test areas where treatment is required;

TTA = the number of test areas in which a treatable abnormality can be found multiplied by the number of children screened;

NA = total number of test areas not assessed, an adjustment to eliminate TAs not assessed for a given number of children.

The lower the HS index, the healthier the subjects.

Their research model, from Campbell and Stanley,[45] was:

Two-screen sample	01	X	02
One screening, occurring when 01 is screened	03		
One screening, occurring when 02 is screened			04

The "0" represents an observation at a given time, i.e. a screening. The "X" represents an "experimental treatment," i.e. a referral. Although PHMC does not state that all those screened were also referred (which would not usually be the case), they note that the focus is on the outcome of exposure to a screening, those who have had this exposure and those who have not. The comparisons are between 01 and 02, a longitudinal comparison and 02 with 04, a cross-sectional one.

Several control procedures were used to validate findings:

1. Since the 01-02 longitudinal comparison is subject to possible "instrument" and history effect,[46] an 03 to 04 comparison was made for

[45] Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Designs For Research, (Chicago: Rand McNally and Company, 1966).

[46] Donald T. Campbell and Julian C. Stanley, op. cit., pp. 7-9.

the purpose of determining whether time itself is an indirect factor. PHMC found the 04 HS index was 21% higher than the 03 HS index and concluded the screening protocol had become more rigorous over time. Since the unadjusted 02 HS was nearly 8% lower than the 01 index, 21% was added to this 8% difference to yield an adjusted reduction of almost 30% in the 02 index as compared with the 01 HS index. Thus, PHMC determined that the incidence of problems decreased nearly 30% for the same children over a two year period of time.

2. Since the cross-sectional comparison of 02 to 04 was subject to selection and regression effects, an adjustment was made based on an 01-03 comparison. The HS index for the 01s was found to be 26% higher (+26%) than the HS for the 03s, indicating that the longitudinal sample (01s) was initially a more sickly group. Since the HS for the 02s was 5% lower (-5%) than the HS of the 04s, the +26% difference was subtracted from the -5% yielding an adjusted HS for the 02s 31% lower than the HS for the 04s. Again, those participating in the program (the 02s) had about 30% fewer abnormalities than the nonparticipant comparison group.

3. A third possible confounding problem was that of maturation in making the longitudinal comparison. Similarly, the cross-sectional comparison could be invalidated by age differences between the two groups. To control both situations, an age-adjustment procedure was used. Basically, a weighted mean was derived which expressed the HS of the 01s and 04s as if these groups had the same age distribution

as the 02s.[47]

PHMC observed that their model was unable to control for a possible interaction (selection-maturation) effect in the longitudinal comparison or for a possible experimental mortality effect in the 02-04 comparison. However, in this particular study PHMC argued that these uncontrolled factors did not confound the results.

In summary of the EPSDT studies, PHMC's central finding was that the rescreened group (02) had an approximately 30% lower overall abnormality rate compared with itself (01) over time or compared with the control group 04 ($p < .05$ for both comparisons). These results are consistent with, and quite similar to, Currier's finding that referral rates were 20% lower for those being rescreened as compared with those receiving an initial screening. Results from both studies support the view that program participation is beneficial.

Reconciling the CHF and AMS studies is a bit more difficult. CHF's study was a comparison of EPSDT participant and nonparticipant costs and utilization during the screening year only. They found the use of amublatory services was higher for the participants but that their overall costs remained lower than those incurred by the nonparticipants. AMS in making the same comparison found no

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$$HS^* = \sum_{1}^{k} (Ni)\ (HSi)/N$$

where HS* = the age adjusted HS;
k = the number of age classes;
Ni = number of test areas assessed in the ith age group of the standardizing group 02 (i.e., TTAi - NAi);
HSi = HS for the ith age group of the standardized group, in this case, 01 or 04.

statistical difference between participants and nonparticipants except for costs in the northern, industrial state which were significantly lower for participants. In the AMS three year longitudinal comparison, utilization and costs increased at a faster rate for the participants (approximately 10% and 20% faster respectively) although total participant costs were lower at each stage of the study. Thus, both CHF and AMS studies found EPSDT associated with a higher use of certain medical services although EPSDT users, in spite of their increased service use, still incurred lower medical costs than those not participating in the program.

Relationship of Demographic Factors to Health

An analysis of the relationship between race and health is faced with several problems.[48] First, since whites are more affluent than minorities, income is a variable. However, studies comparing racial, health differences seldom control for socioeconomic status. Secondly, most data concern mortality rates, certainly an appropriate and important variable but one which is nonetheless not sensitive to any differences less extreme than life or death. As Reid recently wrote:

> . . . the data on illness and disability are so new or so inadequate that it is difficult to establish trends to make statistically sound conclusions on the subject of minority health except from data on mortality.[49] (I.e., information recorded on death certificates.)

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[48]In what follows, "race" is used in a nontechnical sense to refer to whites, blacks, Spanish-speaking and American Indians.

[49]John D. Reid, Everett S. Lee, Davor Jedlicka and Yongsock Shin, "Trends in Black Health," Phylon, XXXVIII(June, 1977), 105-116.

Given these qualifiers, discussion of the racial variable follows. The main point of the discussion is that blacks have poorer health than whites, a fact of particular interest in Michigan where blacks are a large proportion of the eligible population.

Blacks

Succinctly put, the situation is that blacks have higher death rates than whites for all the major causes of death except suicide.[50] Black-white differences exist even before birth. Death of the fetus within the womb is more common among blacks than among whites. Also, newborn blacks are more likely than whites to die during the first year of life.[51]

Lee notes that the chances of anyone dying from childbirth in the United States are exceedingly low, less than 1 woman per 1000. However, she says there are black-white differences and the differences have widened during the twentieth century at the same time rates for both groups were decreasing greatly. In 1973, the maternal mortality rate for whites was 3% of what it had been nearly sixty years previous. However, the 1973 black rate was 4.5 percent of the much higher rate it had recorded in 1915 (11/1000 for blacks versus 6/1000 for whites in 1915).[52]

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[50] Davor Jedlicka, Yongsock Shin and Everett S. Lee, "Suicide Among Blacks," Phylon, XXXVIII (December, 1977), 448.

[51] John D. Reid, et al., "Trends in Black Health," op. cit., p. 105.

[52] Anne S. Lee, "Maternal Mortality in the United States," Phylon, XXXVIII (September, 1977), 260, 262.

Similarly, Kovar found the same pattern in studying the trend of mortality rates between 1950 and 1975. For white infants, the death rate was 26.8 per 1000 in 1950 and 14.2 per 1000 in 1975, a decrease of 47 percent. For black infants, the comparable rates were 43.9 in 1950 and 26.2 in 1974, a decrease of 40 percent. Thus, although both rates decreased greatly in the 25 year period, it decreased less for blacks, i.e., the racial difference widened. Said differently, in 1950, the black infant mortality rate was 64 percent higher than the rate for white infants. However, by 1975, the black rate was 85% higher than the white rate. This means the black infant born in 1975 had a better chance of surviving than a black child born in 1950 but a poorer chance of survival than a white child also born in 1975.[53] These data are particularly interesting since infant mortality is frequently used as a single indicator of national health status.

Reid notes that among whites, 106 males are born for every 100 females, and the number of males remains larger than that of females to about age 40. However, among blacks, only 103 males are born alive per 100 females, and before adolescence is over, there are more females than males.[54]

Wilber says the prevalence of high blood pressure among blacks is about twice as high as among whites.[55] Yabura presents data documenting this claim. He says the death rate for high blood pressure

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[53]Mary Grace Kovar, "Mortality of Black Infants in the United States," Phylon, XXXVIII (December, 1977), 370-97.

[54]John D. Reid, et al., "Trends in Black Health," op. cit., p. 106.

[55]Joseph A. Wilber, M.D., "Hypertension: An Editorial," Phylon, XXXVIII (December, 1977), 353.

and related disease is 58.4 per 100,000 population for blacks compared with 27.1 per 100,000 for whites.[56] Moss and Scott cite data published by the federal government's National Center for Health Statistics on the basis of a 1974 national health interview survey. This showed proportionately more blacks than whites have hypertension, 22 percent versus 15 percent respectively. This pattern was present for all five age groups except those age 17-24 years.[57]

White, in analyzing government statistics, finds that cancer mortality increased greatly between 1949 and 1967 for blacks. In 1949, the cancer mortality rate for blacks was 8 percent *lower* than the white rate. By 1967, the black rate was 18 percent *higher*. The total number of deaths in the black population increased 93 percent between 1947 and 1967 while for whites the increase was 47 percent. The average annual rate of increase of cancer mortality was twice as high for blacks as for whites. Thus, the black death rate from cancer increased both in relation to the earlier black rate and in relation to the rates of whites.[58]

Kitagawa and Hauser analyzed mortality rates for 1959-61. In comparing the more important causes of death, they found mortality rates for blacks of both sexes were greater than those for whites. For cardiovascular disease, the rate for black males was 10 percent

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[56] Lloyd Yabura, "Health Care Outcomes in the Black Community," *Phylon*, XXXVIII (June, 1977), 196 citing Edythe Cudlipp, "High Blood Pressure: A Black Epidemic," *Essence*, IV (October, 1973), 44.

[57] Abigail Moss and Geraldine Scott, "Hypertension: United States, 1974," *Phylon*, XXXVIII (December, 1977), 357-58.

[58] Jack E. White, "Cancer Differences in the Black and Caucasian Population," *Phylon*, XXXVIII (September, 1977), 297.

higher than for white males while black females had a rate 50 percent higher than white females. For cancer, the rate for black males was 22 percent higher than for white males and black females had a rate 12 percent greater than white females. Blacks also had a higher death rate from violence than whites. 16 percent of the deaths of black males were from accident, suicide or homicide - 6 percent were from homicide alone. Almost a third of the deaths of black males aged 15-34 were due to homicide. In comparing the mortality rates of blacks with other minorities, the black rate was highest for all ages five and over.

In yet another way of comparing black and white health status, Kitagawa and Hauser noted black-white differences in expectation of life at birth. They found blacks have a life expectation six years less than whites. The difference exists for both sexes. Black males live 62 years on average versus 68 years for white males; black females can expect to live 70 years versus 76 years for white females.[59]

Michigan's own program statistics reflect a higher incidence of health problems among blacks. For the first five years of the program, the black referral rate averaged 26 percent higher than the white rate, 67.4 percent versus 53.4 percent. The black rate was also higher than that of the Spanish-speaking and American Indian.[60]

Black Differences By Sex

Given the more problematic state of black health, it is also significant that black males have poorer health than black females.

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[59]Evelyn M. Kitagawa and Philip M. Hauser, Differential Mortality in the United States (Cambridge: Harvard University Press, 1973), pp. 106-13.

[60]Michigan Department of Public Health and Michigan Department of Social Services, EPSDT Michigan Annual Report, 1978, op. cit., p. 24. Here the "Referral rate" equals the percent of screened individuals who are referred.

Reid says, "Age by age, and almost cause by cause, death is more common among black males than among black females, . . ."[61] Kitagawa and Hauser state, "There is no doubt that the male is the weaker of the sexes and is more likely to die from almost all of the causes of death that affect both sexes."[62] They report the excess of mortality for males is "considerable" at ages 1-4 and from ages 5 to 45, the death rates for black males are two to three times those of black females. For example, young black males have three times as high a death rate from accidents and suicide and almost six times as high a rate for homicide. For older individuals, black males have death rates from cardiovascular disease 40 percent above those for black females; for cancer, the difference is 60 percent.[63]

The above discussion of black-white differences is particularly relevant to this study of the Michigan program since blacks are by far the largest racial/ethnic group in the state. They comprise about 40 percent of the EPSDT eligible population.

Spanish-Speaking

Grebler, Moore and Gusman in their rather well known book, The Mexican-American People say, " . . . there is no evidence that Mexican-Americans suffer from a higher incidence of total illness or from a

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[61]John D. Reid, et al., "Trends in Black Health," op. cit., p. 105.

[62]Evelyn M. Kitagawa and Philip M. Hauser, Differential Mortality in the United States, op. cit., p. 114.

[63]Ibid., p. 114.

greater prevalence of chronic disease."[64] Michigan referral statistics do show a somewhat greater incidence of problems among Spanish-speaking as compared with whites. However, the difference is not extreme and is much less than the black-white gap. During the program's first five years, the Spanish-speaking referral rate averaged 7 percent higher than the white rate, 57 percent versus 53.4 percent.[65]

American-Indians

Kitagawa and Hauser found that American-Indians had the second highest mortality rate among American racial/ethnic groups.[66] Sorkin, a health economist who has done considerable study of Indian health, compared infant mortality rates and deaths from tuberculosis and gastroenteritis between 1955 and 1971. He found rates for reservation Indians dropped 62%, 87% and 83% respectively. As of 1971, Indian infant mortality was 37 percent higher than the white rate but 24 percent lower than the rate for blacks. In regard to tuberculosis and gastroenteritis, the Indian rate was higher than either white or black rate.[67] However, the health indexes of reservation Indians may not be strongly comparable to the Michigan situation. Michigan program statistics show virtually no difference in average referral rates for whites

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[64] Leo Grebler, Joan W. Moore and Ralph C. Gusman, The Mexican-American People, (New York: The Free Press, 1970), p. 23 citing A. Taher Moustafa, M.D. and Gertrud Weiss, M.D., Health Status and Practices Of Mexican-Americans, (Mexican-American Study Project, Advance Report II, Graduate School of Business Administration, University of California at Los Angeles, February, 1968.

[65] Michigan Department of Public Health and Michigan Department of Social Services, EPSDT Michigan Annual Report, 1978, op. cit., p. 24.

[66] Evelyn M. Kitagawa and Philip Hauser, Differential Mortality in United States, op. cit., p. 101.

[67] Alan L. Sorkin, Health Economics, (Lexington, Massachusetts: D.C. Heath and Company, 1975), p. 160.

and American Indians for the program's first five years, 53% and 53.6% respectively.[68]

Based on the above review of the association between race and health, this study was particularly interested in the program's effects on black participants. The size of Michigan's black, eligible population plus evidence showing blacks to have generally poorer health than white and other racial groups, made the program's effects on blacks to be of particular signficance.

Sex

In discussing differences in black health status based upon sex, Kitagawa and Hauser note that the pattern of female superiority on virtually all indices holds also for whites.[69] Accordingly, whether sex has an influence on the program's outcomes was also of interest in this study.

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[68]Michigan Department of Public Health and Michigan Department of Social Services, EPSDT Michigan Annual Report, 1978, op. cit., p. 24.

[69]Evelyn M. Kitagawa and Philip M. Hauser, Differential Mortality in the United States, op. cit., p. 114.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

As noted above, there are indications in the literature that EPSDT program participation is associated with improved health status. The purpose of this chapter is to discuss the research design, methodology and statistical techniques used by this study to determine whether such an association exists for EPSDT participants in Michigan. This central concern with the program's outcomes results in the study having one objective, the attainment of which was sought be testing three hypotheses and by answering two key questions.

Objective of Study

(1). To better answer the question of whether EPSDT in Michigan is improving the health status of its participants.

Hypotheses

(1). Screenings and referrals are inversely related in number, i.e. the average number of referrals one incurs is inversely related to the total number of lifetime screenings one has received.[1]

(2). Medicaid costs are inversely related to the total number of lifetime screenings one has received, i.e. costs decline as lifetime screenings increase.

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[1]The "average number of referrals" = the total number of referrals divided by the total number of individuals screened.

(3). Short-run Medicaid costs increase following screening, are greater (following screening) for screened than for unscreened individuals and (as in #2 above) are inversely related to the total number of lifetime screenings one has received.

Questions

(1). Do outcomes vary by age, race, sex and, to a limited extent, geographic location?

(2). Do outcomes vary depending upon whether subjects are continuously eligible for the program?

Design I

Referral Rate Differences

As indicated above, one approach of this study for assessing indirectly the effects of EPSDT used the average number of referrals at last screening (referral rates) as the dependent variable. Referral rates were compared with the degree of program participation on the assumption that if the program is meeting its objective of better health for its participants, then those being rescreened should have fewer referrals than those initially screened and, also, the number of referrals should decrease as the number of rescreenings increases. Said differently, this means referrals should be less for individuals who have received more screenings as compared with individuals who have received fewer screenings. Diagrammatically, this approach can be represented by Design I, which follows, per Campbell and Stanley model.[2]

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[2]Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Designs, op. cit., p. 6.

Each X represents a screening and each 0 represents the observation or, in this case, the determination of referrals (of course, in practice the referrals of interest are identified at the last, i.e. most recent screening).

```
                X  0
- - - - - - - - - - -
             X  X  0
- - - - - - - - - - -
          X  X  X  0
- - - - - - - - - - -
       X  X  X  X  0
- - - - - - - - - - -
    X  X  X  X  X  0
```

Since population data were gathered using Design I, one means of data analysis consisted of simply making a direct comparison of the results per the following table display:

Table I. Average number of referrals at last screening by age and number of lifetime screenings.

Age At Last Screening			No. Of Lifetime Screenings	
1 Screen	2 Screens	3 Screens	4 Screens	5 Screens or More
Under 1 Year				
1 Year				
2 Years				
.				
.				
.				
20 Years				

Table I allows a comparison to be made, by age, of the average number of referrals needed at the last screening for five or more groups of program participants. These groups are distinguished by the number of lifetime screenings received. They are:

(1). The individuals who have received one screening, by age;

(2). The individuals who have received two screenings, by age;

(3). The individuals who have received three screenings, by age;

(4). The individuals who have received four screenings, by age;

(5). The individuals who have received five screenings, by age;

(6). When available, data can be presented for those individuals who have received six lifetime screenings, seven lifetime screenings, etc.

When analyzing the table, the question is whether values in each row decrease as one moves left to right.

Age at last screening is controlled since referrals are to some extent a function of age.

Referrals for immunization, when present, were not counted as referrals since the need for immunizations is at times a cause for referral and at other times not a reason to refer. The difference depends solely upon whether the clinic gives immunizations as part of the screening process or refers the child elsewhere for this service. Thus, because of this difference in service delivery, immunization referrals were totally excluded from consideration.

The Table I format was completed for the two groups of program participants selected for study in this research. One group was the population continuously eligible for EPSDT since 1/01/74 (i.e., they were "welfare recipients" during this entire time period). Data for this group are presented in the Table I series (explained below). The other group of subjects was the population eligible for EPSDT during calendar year 1979. Data for this group are presented in the Table I format but are labeled as Table II, simply for purposes of distinguishing the two groups. More discussion of the study groups is presented later in this chapter.

Table I/II Replications (Tables I(A)/II(A)-I(S)/II(S)

Tables I and II were replicated as the referral rates at last screening varied by sex, race, and to a limited extent geographic location. Tables were titled as follows:

Tables I/II - Average number of referrals at last screening by age and number of lifetime screenings;

Tables I(A)/II(A) - Average number of referrals at last screening for whites, by age and number of lifetime screenings;

Tables I(B)/II(B) - Average number of referrals at last screening for blacks, by age and number of lifetime screenings;

Tables I(C)/II(C) - Average number of referrals at last screening for American Indians, by age and number of lifetime screenings;

Tables I(D)/II(D) - Average number of referrals at last screening for Spanish-speaking, by age and number of lifetime screenings;

Tables I(E)/II(E) - Average number of referrals at last screening for males, by age and number of lifetime screenings;

Tables I(F)/II(F) - Average number of referrals at last screening for females, by age and number of lifetime screenings;

Tables I(G)/II(G) - Average number of referrals at last screening for white males, by age and number of lifetime screenings;

Tables I(H)/II(H) - Average number of referrals at last screening for white females, by age and number of lifetime screenings;

Tables I(I)/II(I) - Average number of referrals at last screening for black males, by age and number of lifetime screenings;

Tables I(J)/II(J) - Average number of referrals at last screening for black females, by age and number of lifetime screenings;

Tables I(K)/II(K) - Average number of referrals at last screening for American Indian males, by age and number of lifetime screenings;

Tables I(L)/II(L) - Average number of referrals at last screening for American Indian females, by age and number of lifetime screenings;

Tables I(M)/II(M) - Average number of referrals at last screening for Spanish-speaking males, by age and number of lifetime screenings;

Tables I(N)/II(N) - Average number of referrals at last screening for Spanish-speaking females, by age and number of lifetime screenings;

Tables I(O)/II(O) - Average number of referrals at last screening for participants in Detroit, by age and number of lifetime screenings;

Tables I(P)/II(P) - Average number of referrals at last screening for participants in selected outstate counties, by age and number of lifetime screenings.

Tables I(Q)/II(Q) - Average number of referrals at last screening in Detroit and Northern Michigan, by age and number of lifetime screenings;

Tables I(R)/II(R) - Average number of referrals at last screening, by number and year of screening ($N \geq 100$);

Tables I(S)/II(S) - Percent change in average number of referrals at last screening as number of lifetime screenings increase by one, by year of screening.

For each of Tables I(A)/II(A)-I(Q)/II(Q) an accompanying table is presented giving the number of screened individuals represented by Tables I(A)/II(A)-I(Q)/II(Q). The number of screened individuals, in total, and as a function of age, sex, race and to a limited extent geographic location is thus identified. These tables are placed in Appendices A and B for reference.

Design I Statistical Analysis

As discussed, data were obtained per Design I and are presented in the following chapter in the Table I format. However, upon analyzing the obtained data an intervening variable was identified which qualifies the Table I and Table II results. When year of screening is used as an independent variable, it is evident that over the years referrals have been given with less frequency. The overall referral rate in 1978-79 was approximately half what it had been in 1973-74. This is a "classic" Campbell and Stanley case of history becoming an independent variable and jeopardizing the study's internal validity.[3] For some reason(s) clinic personnel made fewer referrals in the program's later years. This confounds results. To the extent we find those with more screenings having fewer referrals, we are uncertain by using a direct comparison of Table I results whether, or to what extent, the decreasing referrals are due to program participation or the confounding variable of time. This complication, which is itself an interesting finding, led

[3] *Ibid.*, p. 5.

to several compensating adjustments in statistical analysis and to a more detailed analysis of Table I and II data.

One control for time of screening was to analyze referral rates derived from same-year screenings only. However, since data are available for seven years and the Table I series consists of twenty reports for each of two subject groups, it was deemed impractical and unweildy to generate all the possible reports this approach would allow (280 reports). Several approaches were used to avoid such a clumsy method of analysis.

Observation of Table I/II referral rates showed that the pattern of grand mean change across the number of lifetime screenings was generally representative of change across the individual ages. This allowed a greatly simplified Table I/II analysis since it meant conclusions could be made on the basis of several grand means rather than on means for each of twenty-one separate ages. Thus, one means of controlling history was to present grand means for each year (by number of screenings) and determine whether these data change within each year as predicted by Hypothesis 1. This provided a quite straightforward and definitive test of the relationship.

Also, Table I format (with age thus controlled) was generated for screenings which occurred in 1978 only. 1978 was chosen as the year of study since it is a recent year which contains relatively large numbers of individuals with rescreenings. Data so obtained on the continuously eligible group are presented as the Table III series; data obtained on those eligible for at least all of 1979 are presented as the Table IV series. This approach also controlled for history.

In addition, formal testing of Hypothesis 1 was done with history controlled, as explained below. In short, the effects of history proved to be manageable and its presence in the program was an important finding of the study.

Also, in analyzing the Table I-IV data, recalculations were frequently made to average all referral rates from rescreenings and thereby allow comparison with referral rates occurring at initial screening. In other words, the comparison was made between rates at "one screening" and rates for "two or more screenings." This simplified numerous comparisons.

Because of the effect of "screening year" on the dependent variable, it was determined that the use of the multiple regression technique would be most appropriate for formally testing Hypothesis 1, i.e., whether screenings and referrals are inversely related in number. Technically, since the independent variable "year of screening" is a nominal variable, with each year representing different categories of that variable, and the other independent variable "number of lifetime screenings" is a metric, or interval, variable, the method of statistical analysis used is termed analysis of covariance, or more precisely, the multiple regression method of analysis of covariance.

Multiple regression is a standard statistical technique used to analyze the relationship between a dependent variable and set of independent variables. It analyzes the data from two perspectives: (1) descriptive, determining the linear relationship of the dependent variable on the independent variables and (2) inferential, evaluating relationships in the population by examination of sample data, for example by hypothesis testing. As a descriptive tool it has the valuable ability to control for confounding variables, a quality which made it particularly helpful for this study.

The standard assumptions were made in using the regression techniques. They are:

(1). The sample is drawn at random.

(2). The criterion variable is distributed normally, or at least can be measured on an internal scale.

(3). The regression of criterion and predictor variables is linear.

(4). All the criterion variable's arrays have the same variance.[4] Since the sample sizes were very large and the samples were randomly drawn per accepted procedures, the assumptions are reasonable.

In addition, the technique of Categorical Partition Analysis (CPA) was used as a third, and supplementary means of analyzing the data on referral rates. CPA is a fairly new and advanced statistical technique, reliant upon the calculating ability of high speed computers, and is not widely known.[5] It is designed for use with categorical data (nominal and ordinal such as race and military rank respectively) which

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[4]Norman H. Nie, et al., <u>Statistical Package for the Social Sciences</u>, (New York: McGraw Hill Book Company, 1975), pp 341, 399. The text notes that the assumption of normal distribution may be relaxed when the sample size is large.

[5]Richard Andrew Bartlett, "Partition Analysis of Categorical Data," (Unpublished Doctoral Dissertation, The University of Pennsylvania, 1974).

should make it of particular interest to social researchers since their data are often categorical.

CPA is a type of classification analysis which seeks associations between variables. Procedurally, it establishes a series of contingency tables pairing in turn each independent variable with each dependent variable(s) of interest and measures the degree of association between the various "levels" of each variable (for example, the variable sex has two levels and in this study the variable referral rate has seven levels). For the table whose cells have the highest significant reduction in prediction error (i.e., the difference in error rates obtained by predicting with the predictor variable rather than predicting with a simulated predictor variable which is statistically independent of the criterion), a "split" is made. The split is made on the basis of those aggregate cells responsible for the reduction in prediction error versus those cells not responsible. Two subgroups are thereby formed: one subgroup associated with a level of the dependent variable at a frequency of occurrence which is greater than chance; the other subgroup showing no such relationship. The technique then continues testing in the same manner for an association between the two obtained subgroups and each other predictor variable of interest. Subsequent splits, if any, are similarly made on the predictor variable with the highest significant reduction in prediction error. The process continues as long as significant splits can be made and ends when splits no longer occur. However, it may be the case that no split occurs on any predictor variables, i.e. there is no relationship found between any of the levels of the variables of interest.

For example, CPA could be used to test the association between automobile accident fatalities and certain demographic variables and could find, for example, that 15-17 year old white males who own General Motors cars in Northeastern Michigan are unusually prone to fatal automobile accidents. To achieve this result, splits would be made on the basis of age, race, company-make of automobile owned and geographic location.

CPA is of course somewhat more complicated than presented here but since its application to this study's data yielded no splits, further explication of the technique seems unnecessary.

CPA independent variables used in this study were:

(1). Sex,

(2). Race,

(3). Screening year,

(4). Location,

(5). Age and

(6). Number of screenings.

The dependent variable was the average number of referrals at last screening or the referral rates.

Design II

Cost Differences

The theory of preventive health and the cost effectiveness rationale for EPSDT both argue that early detection and treatment will result in reduced, long-run medical costs. Again, this should occur as deleterious conditions are not allowed to deteriorate to more advanced, complicated and therefore costly levels. To assess these long-run changes, the ideal approach would be a time-series of the design given below. As before, each 0 would represent an observation, or determination of costs incurred during a given period, and each X would represent a screening:

```
0   0   0   0   0   .   .   .
0 X 0   0   0   0   .   .   .
0 X 0 X 0   0   0   .   .   .
0 X 0 X 0 X 0   0   .   .   .
0 X 0 X 0 X 0 X 0   .   .   .
```

In this ideal design, subjects would be randomly selected for participation and randomly assigned to the study groups. A control group, having received no screenings, would be included as well as several test groups, each to receive a different number of screenings. The number of subjects used would be large. Observations could be done at yearly intervals and would continue for a number of years. Costs could be analyzed in total and by different provider types, e.g. physician, inpatient hospital, dental, etc. However, as mentioned previously, this study did not have the resources, or time, to undertake a true longitudinal design.

Neither was it possible to conduct a post hoc, computer-based study which sampled among current eligibles and then analyzed their past cost data. This approach was not feasible since Medicaid claims' data are readily available for only the most recent year to year and a half. Moving back further in time becomes technically more difficult, such as requiring the use of several different computer programs. Enlisting the voluntary assistance of technical staff is virtually impossible for this level of activity.

The design which was possible to effect used data from only the most recent time period but also took into consideration the recipient's past screening history. This approach is similar to the one above with the exception that data are obtained from only one time period, the most recent, rather than from several. Specifically, costs were determined for 1979 only, a period for which all test subjects were continuously eligible. The design is identical to Design I with the exception that clients are added to the design who have never been screened.

<u>Design II</u>

```
                    0
- - - - - - - - - - -
                 X  0
- - - - - - - - - - -
              X  X  0
- - - - - - - - - - -
           X  X  X  0
- - - - - - - - - - -
        X  X  X  X  0
- - - - - - - - - - -
     X  X  X  X  X  0
```

Some costs obtained by this design could be considered proxies for long-run costs. These would be the costs incurred by recipients with a greater degree of program participation, i.e. more screenings. For recipients to have received three or more screenings, program participation must have extended over a number of years. Their most recent costs, the costs which can be assessed, are therefore costs incurred at the end of a process, i.e. they are in effect long-run costs.

Data obtained by the design could be displayed in a manner similar to the Table I format:

Cost (for selected variable) by age and number of lifetime screenings.

Age At Survey Mid-Point	Total Number of Lifetime Screenings					
	0	1	2	3	4	5 or More Screenings
5 Years						
6 Years						
7 Years						
.						
.						
.						
20 Years						

Using this approach, conceivably costs could be presented in total and by provider type and demographic variable for each of the two subject groups used in the study. However, this approach would generate 272 different tables (8 provider types x 17 demographic variables x 2 subject groups) each requiring statistical testing to determine whether the obtained differences were true ones. Although data were available to make this type of presentation, it was determined impractical and unnecessary to present and test the data by such a procedure. Economy of statistical testing allowed the same hypothesis and questions to be tested in a much more concise manner.

Design II Statistical Analysis

Athough a history effect was determined to be confounding the Design I analysis, costs, as a dependent variable, were not similarly subject to such influence. While the clinic personnel who determined referral needs apparently did adjust their referral criteria over time, thereby making the time (year) of last screening a variable for referral rates, this circumstance had no influence on costs which were studied in one year only. In essence, while the last screening, the "treatment" and occasion to calculate the "average number of referrals at last screening," could occur during any program year, costs were observed only during 1979. Thus, when costs were used as the criterion variable, time was controlled as a factor by the study's design, whereas referral rates were statistically controlled through using the multiple regression technique and other approaches. Consequently, year of screening was not used as a variable in analyzing the cost data. With number of screenings the only, and necessary, variable to test Hypothesis 2, the regression technique used was technically bivariate rather than multiple regression.

Also, visual inspection of results disclosed that average, total costs were greater for unscreened than for screened subjects for both the long-term and shorter-term eligibles. To determine whether these sampled mean differences implied a true difference in the parent populations, Student's t-test was used. The test was applied to both study groups and was also repeated as costs varied for the four "racial" groups. SPSS includes a standard sub-program for conducting Student's t-test. The test is the appropriate procedure for testing differences in sampled mean scores, which was the point of interest here. The assumptions made in using the t-test are essentially those made when using multiple regression. They are:

(1). The dependent variable (costs) is normally distributed in both populations of study and

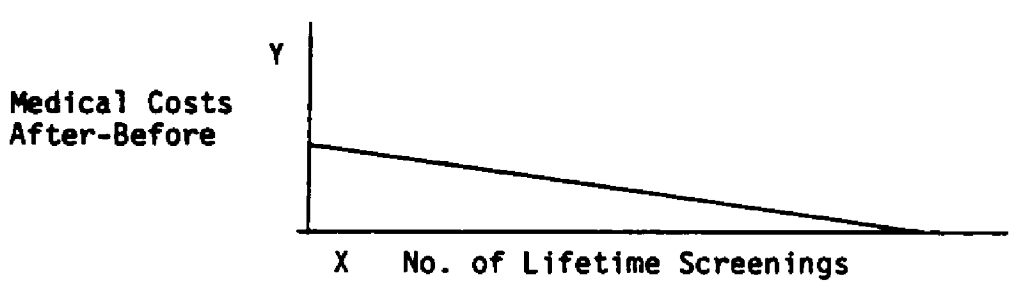
(2). The variance of the dependent variable has the same value (is homogeneous) for both populations.

There is no reason to not believe these assumptions are valid for the study groups, especially since the sample sizes are large and subjects were randomly selected from their populations.

Design III

Short-Run Cost Differences

Implicit in the program's expectation of long-run cost savings is the suggestion that short-run costs will increase. Implementation of a program which aims to increase access to medical services, and to encourage the use of those services, should increase immediate medical costs if the program is successful. As noted previously, this aspect of the program was a cause of concern for cost conscious states and did not serve to increase its popularity. Accordingly, it is of interest whether, and to what extent, short-run costs do increase as expected. This interest is formalized in Hypothesis 3 which states that short-run costs do increase following screening, are greater for screened than for unscreened individuals and are inversely related to the total number of lifetime screenings one has received. Graphically, the hypothesis is depicted well by the following diagram:



Design III allows Hypothesis 3 to be tested:

<u>Design III</u>

```
            0  X  0
- - - - - - - - - - -
         X  0  X  0
- - - - - - - - - - -
      X  X  0  X  0
- - - - - - - - - - -
   X  X  X  0  X  0
- - - - - - - - - - -
X  X  X  X  0  X  0
```

For each test subject who was screened during the period May-August, 1979 (denoted by the X positioned farthest to the right in the design), medical costs were determined for the four month period prior to screening, specifically January-April, 1979 and the four month period following screening, specifically September-December, 1979. The Os in the diagram denote the determination of medical costs for the given time period, or observations, in a before and after screening pattern.

Design III Statistical Analysis

As with Design I and II, the Table I format of data presentation was determined to be theoretically possible, but impractical and unnecessary for analyzing the obtained data. Instead, a bivariate regression was done to test Hypothesis #3 per the same rationale presented in discussing the Design II Statistical Analysis. Again, number of lifetime screenings was the independent variable.

Procedures-Sample

There are different client subgroups upon which one might focus for this type of study. Two seem most prominent: (1) those now eligible for the program and (2) those continuously eligible since the program's early years (the latter is actually a subgroup of the former). In designing this study, it was felt basic consequences would flow from studying either group. Specifically, the types of conclusions which could be drawn would be determined by the choice of which group(s) to include in the study. Some discussion of the rationale for including these different groups is thus warranted. First, two reasons will be detailed for studying those continuously eligible; next, the advantages will be reviewed for studying those currently eligible.

(1). Approximating A Longitudinal Study - One Argument for Studying Those Continuously Eligible. If this project had been undertaken when the EPSDT program began, a longitudinal study might have been designed. Subjects would have been chosen at that time and followed over the ensuing years. Those subsequently "dropping out" would no longer have been followed; nor would others have been included in the project after it had begun. This research was of course not designed and begun years ago. However, in terms of subject selection, an essentially "retrospective longitudinal study" was still possible by appropriately selecting those who had been continuously eligible since the program began. This approach produces the same study group which would have been chosen and followed had the study been designed and implemented years ago. Similarly, it excludes, as would a true longitudinal study, both those who did not initially begin the study (late entrants) and those who might have started with the original group but later terminated (drop outs).

(2). Identifying Subjects of Maximum Interest - A Second Argument for Studying Those Continuously Eligible. It is reasonable to believe that clients who are continuously eligible are more likely to receive multiple screenings. By virtue of their presence and repeated recruitment, they have the most consistent opportunity to participate in the program. Accordingly, this group is an important inclusion in the study. Since they have possibly received maximum program benefits, it is crucial to know what impact the program has had upon them. If they show little or no effects, this is highly significant. However, since this group was presumed to be relatively small, it was believed merely sampling from those currently eligible would likely miss or underrepresent them.

(3). Generalizing Findings to a Larger Population - The Argument for Studying Those Currently Eligible. A large proportion of recipients are not continuously eligible and do not participate regularly in the program. However, precisely because these clients are in the majority, it is important to know what effect, if any, the program is having upon them. Said differently, their inclusion is important for assessing the range of the program's impact even though the program's influence on them is likely diminished because of their reduced participation. Studying this group allows conclusions to be made about a larger and more typical client group.

Resolution Regarding the Choice of Subjects. Because of the potential value of studying both those continuously and currently eligible, both groups were included in the study. Exclusion of either could have led to shortcomings in the methodology or outcome. Selection procedures (explained below) were thus conducted twice, once for each group, to thereby include in the study both those continuously and currently eligible.

Selection Strategy. (1). To include in the study those continuously eligible for the program, certain selective criteria were applied. Subjects must have been:

(a) Continuously eligible for Aid to Families with Dependent Children (AFDC) between 1/01/74 and 12/31/79,

(b) Under age 21 (as of 12/31/79) and

(c) Not members of a Health Maintenance Organization (HMO). (Necessary to exclude since HMO member costs are not entered in the Medicaid claims system.)

Per the Table I format, information regarding referral rates was generated for all individuals who met the above criteria. This population numbered 79,754. To formally test hypotheses 1- 3, a systematic sample of 15,951 subjects (20%) was chosen. A "systematic sample" means every twentieth subject was chosen who met criteria a-c above. The first subject selected, or the "starting point," was determined by use of a random numbers table. The high sample rate is indicative of interest in this group.

(2). To include in the study those currently eligible for the program, the following criteria were used:

(a) Eligible for AFDC during at least all of calendar year 1979,

(b) Under age 21 (as of 12/31/79) and

(c) Non HMO membership.

Again, per the Table I format, information regarding referral rates was generated for all individuals meeting the above criteria. This population numbered 244,551. To formally test hypotheses 1- 3 with this group, a systematic sample of 16,303 subjects (6.67%) was chosen. Again, a random numbers table was used to determine the first subject chosen. "Currently eligible" was determined to mean elibible for at least all of 1979 in order to equalize the time period of potential participation in the Medicaid program. Otherwise, the varying duration of subject eligibility would confound the amount of Medicaid costs incurred.

Collection of Data

Computer data needed for this study was stored in two locations: (1). The Client Information System (CIS) contains information on all recipients of DSS programs. Such information includes demographics and medical cost data in addition to basic identifying information. (2). The "EPSDT Master Files" contain each child's screening results, by year of screening. Tapes are available for the years 1974 through the present and include the results of most screenings which have occurred in Michigan. Information regarding referral rates was obtained by conducting a computer count of specified data stored on the EPSDT Master Files for those selected subjects who received EPSDT screening(s) in the state of Michigan between January 1, 1974 and December 31, 1979.

More specifically, data were gathered in the following manner:

Client Selection

(1). The subjects who had been continuously eligible for the program were identified by -

(a) Selecting subjects from the Client Information System per above selection criteria and

(b) Sorting selected subjects into recipient I.D. order.

(2). The subjects currently eligible were identified by -

(a) Selecting the subjects from CIS per the above selection criteria and

(b) Sorting selected subjects into recipient I.D. order.

Referral Rate Data

(1). The desired data were obtained from the EPSDT tapes per the following procedures -

(a) Hanging each tape, one at a time, and extracting the following data elements onto a separate tape -

(A) recipient's I.D. number,

(B) recipient's date of birth,

(C) recipient's sex,

(D) recipient's descent (race) code,

(E) recipient's date of screening,

(F) agency which performed the screening and

(G) recipient's number of referrals (excluding referrals for immunizations).

(b) The extracted data were sorted into recipient I.D. order and by date of screening for each recipient I.D. with multiple screenings. The result of this process was a "merged file" with the extracted data organized into recipient I.D. order and chronological order "under" each I.D. with multiple screenings.

(2). The desired data were secured for both the continuously eligible and currently eligible groups of subjects by -

(a) Passing each of their tapes against the merged file and

(b) Pulling off into a separate tape data from the merged file each time there was a match of recipient I.D. numbers on the two tapes (while retaining for future use a record of those selected from CIS for whom no screening occurred),

(c) The statistical Package for the Social Sciences (SPSS) was used to calculate the following for each of the study groups:

(A) the total number of screenings received,

(B) the age at most recent screening and

(C) the number of referrals made at the most recent screening.

(3). The calculated data were printed in the format of Tables I/IV-IP/IVP.

(4). SPSS was used to formally test Hypothesis 1.

Long-Run Costs

(1). Using the subjects and data secured for Design I analysis (tapes developed at completion of step #4 above)

(a) The FC reporting system was run for each group of subjects to secure and print the desired cost data in the Table I format and

(b) SPSS was used to formally test Hypothesis #2.

Short-Run Costs

(1). Using the subjects and extracted information secured for Design I analysis (tapes developed at completion of step #4 above),

(a) The FC reporting system was run to secure the desired before-and-after screening costs for each selected subject screened between May 1, 1979 and August 31, 1979 and then to print the results in the basic Table I format for each of the two groups of study subjects;

(b) SPSS was used to formally test Hypothesis #3.

CHAPTER IV

RESULTS

This chapter presents the study's findings in the following order: First, the Table I and II series are analyzed in relation to Hypothesis I and the impact of demographic factors on referral rates. Breakdowns then follow showing both history's influence on these same results and the results with history controlled. To assess further the results with controls, the regression analysis of Hypothesis I and the outcomes for same-year screenings only are discussed. CPA affords the concluding perspective for analyzing referral rates. Cost data analysis proceeds by reporting, in turn, the Hypothesis 2 regression analysis, the t-test outcomes and the regression analysis of Hypothesis 3.

Table I Results

Controlling the variable age in the Table I/II series served a purpose while at the same time it created a need to simplify the obtained results. Any attempt to discuss results in detail for each of twenty-one ages in some thirty different tables is unwieldy, if not unmanageable. Fortunately, review of the tables discloses that changes in the grand mean generally reflect similar movement for most of the individual ages. This is not surprising but this documented consistency does give justification for analyzing grand mean changes only. In other words, presenting data by age has established that it is not misleading or unwarranted to base conclusions on solely the grand mean. Accordingly, table analyses will proceed by grand mean analysis.

A qualification in interpreting the table results arises from the apparent relationship existing between group size and reliability of data. The obtained results show small groups generally have higher referral rates. Thus, referral rates are often higher for those groups having six-seven lifetime screenings than for groups with four or less screenings. This is exactly opposite the prediction of Hypothesis 1, but it is most likely that the explanation is rooted in group size, not treatment effect. Very few participants have received six or seven screenings and referral rates appear to be unreliable when based on a small number of subjects. This is another way of saying referral rates show considerable variance. Such variance equalizes over a large number of subjects but can be very distorting when few subjects are involved. Accordingly, unreliability of data is thought to explain the upward turn in referral rates at the highest levels of program participation and, because of this, all results derived from small-sized groups are discounted. Referral rates for those with six or seven screenings will systemmatically not be considered or discussed. Also, other grand means based on less than 100 subjects will likewise either be discounted routinely or interpreted with reservation. The designation "small group size" appears warranted for at least those groups with less than 100 subjects.

In the Table I series which follows, each table of referral rate data has a companion table giving the number of subjects from which the referral rates were derived. This companion series has been placed in Appendix A and has a complementary numbering system for easy reference. Each "N" table is numbered identically to its companion table of referral rates with the exception of a lower case letter in parenthesis. For example, to find the "Ns" for Table I(E), refer to Table I(Ea) in Appendix A. The Ns are important to this study since, as discussed, referral rates generally show meaningful change over only fairly large groups of subjects.

Table I grand mean results support the Hypothesis I prediction as lifetime screenings increase from one to four screenings. An upturn in referrals does occur at screening five but the increase is small and the rate at that point is still at a lower level than occurs at screenings 1-3. In short, good, but not perfect, agreement exists with Hypothesis 1 for the long-term eligibles. Furthermore, in comparing initial screening rates, by age, with rates for all screenings combined, observation of the table shows repeat screenings obviously have lower referral rates for every age with only a few possible exceptions. Calculations for ages one-three show they are also consistent with the pattern, i.e. those with rescreenings have lower referral rates at every age. For all those rescreened, the actual rates are .846 referrals at last screening as compared with 1.185 referrals for those receiving an initial screening. This is a 29 percent decrease; those being rescreened have markedly fewer referrable conditions than those being screened for the first time.

Table I. Average number of referrals at last screening for long-term eligibles by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
Under 1	1.063	.846	-	0	-	-	-
1	1.135	.851	1.25	-	-	-	-
2	1.014	.790	1.058	0	0	-	-
3	1.156	.933	.871	1.000	2.000	-	-
4	1.270	.925	.952	.818	1.666	-	-
5	1.174	.941	.854	.910	.777	1.333	-
6	1.218	.926	.733	.674	.771	.200	1.000
7	1.188	.917	.737	.612	.818	0	-
8	1.187	.893	.799	.612	.687	.285	0
9	1.161	.841	.696	.683	.555	-	.667
10	1.226	.850	.716	.737	.760	0	-
11	1.159	.870	.758	.718	.739	.333	-
12	1.181	.881	.750	.555	.500	.500	-
13	1.175	.874	.813	.582	.647	.500	-
14	1.228	.916	.780	.833	.500	-	-
15	1.202	.937	.802	.911	.928	1.500	-
16	1.238	.949	.870	.959	.625	-	-
17	1.236	1.040	.890	.697	.428	-	-
18	1.452	1.034	.915	1.000	.500	1.000	-
19	1.565	.965	1.025	1.400	1.000	-	-
20	1.400	1.166	.500	0	-	-	-
Grand Mean	1.185	.899	.780	.708	.719	.466	.600
% Change As No. Screenings Increase By One		-24%	-13%	-9%	+2%	-35%	+28%

Tables I(A)-I(D) are concerned with the effect of race on referral rates. Two questions are foremost: (1) Is Hypothesis 1 affirmed for each racial group and (2) do rates vary across racial groups?

Table I(A) shows that rates for whites are inversely related to lifetime screenings with the exception of moving from four to five screenings. However, again, those with five screenings have a lower referral rate than those with one-three screenings. The referral rate for all those rescreened is .778, a 25 percent reduction from the 1.039 rate for those initially screened.

Blacks [Table I(B)] show a perfect inverse relationship to program participation over the first five screenings with a meaningful drop in referrals for each additional screening. The referral rate for all those rescreened is .920, a 31 percent reduction from the rate at initial screening. Black results are also noteworthy in that at each screening, blacks have a higher referral rate than whites. At initial screening their rate is 28 percent higher (1.330 - 1.039/1.039). For all repeat screenings, their rate is 18 percent higher (.920 - .778/.778). In short, these results show blacks seem to benefit from repeated program exposure and, at the same time, are disproportionately in need of EPSDT as evidenced by their higher level of problem determination.

Results for American-Indians [Table I(C)] are likely unreliable since no cell contains one hundred subjects or more. Accordingly, these results will be discounted and no conclusions will be drawn regarding American-Indians.

Table I(A). Average number of referrals at last screening for long-term eligible whites by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
Under 1	.835	.833	-	-	-	-	-
1	.996	.789	1.000	-	-	-	-
2	.920	.714	.727	0	0	-	-
3	1.018	.890	.891	1.000	-	-	-
4	1.180	.910	.863	.666	2.000	-	-
5	1.061	.953	.805	.926	1.000	0	-
6	1.143	.879	.771	.738	.600	.250	-
7	1.110	.811	.662	.605	.782	0	-
8	1.055	.832	.709	.558	.466	.250	0
9	1.034	.751	.675	.537	.375	-	0
10	1.090	.790	.627	.631	.636	0	-
11	.961	.831	.682	.581	1.100	0	-
12	.953	.789	.613	.584	.692	.500	-
13	.934	.786	.787	.455	.666	0	-
14	1.008	.835	.708	.634	.555	-	-
15	.924	.874	.686	.755	1.000	-	-
16	.945	.833	.842	1.000	.333	-	-
17	.957	.861	.813	.636	0	-	-
18	1.111	.675	.529	1.000	-	1.000	-
19	1.875	.777	1.200	-	-	-	-
20	2.000	0	-	-	-	-	-
Grand Mean	1.039	.830	.713	.634	.706	.200	-
% Change As No. Screenings Increase By One		-20%	-14%	-11%	+11%	-72%	-

Table I(B). Average number of referrals at last screening for long-term eligible blacks by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
Under 1	1.245	1.000	-	-	-	-	-
1	1.253	.884	1.333	-	-	-	-
2	1.104	.857	1.666	0	-	-	-
3	1.277	.985	1.000	1.000	2.000	-	-
4	1.379	.944	1.056	1.000	1.000	-	-
5	1.287	.928	.900	.927	.642	2.000	-
6	1.295	.972	.695	.664	.909	0	1.000
7	1.276	1.008	.831	.640	.800	-	-
8	1.327	.981	.906	.686	1.000	.333	-
9	1.290	.958	.744	.814	.700	-	1.000
10	1.382	.931	.815	.883	.818	-	-
11	1.366	.927	.862	.873	.416	-	-
12	1.420	.998	.871	.579	.181	-	-
13	1.365	.962	.857	.724	.636	1.000	-
14	1.420	.993	.828	1.014	.333	-	-
15	1.401	1.004	.874	1.031	.857	1.500	-
16	1.394	1.024	.892	.957	.800	-	-
17	1.374	1.166	.884	.727	.666	-	-
18	1.574	1.213	1.033	1.055	.500	-	-
19	1.500	1.042	.846	1.400	1.000	-	-
20	.857	1.400	.428	0	-	-	-
Grand Mean	1.330	.975	.849	.799	.722	1.000	1.000
% Change As No. Screenings Increased By One		-27%	-13%	-6%	-10%	+38%	0%

Table I(C). Average number of referrals at last screening for long-term eligible American-Indians by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
Under 1	0	-	-	-	-
1	.333	-	-	-	-
2	1.000	-	-	-	-
3	1.400	.500	-	-	-
4	.333	.833	1.000	-	-
5	1.000	1.333	.500	.500	-
6	.666	1.142	.500	.500	.500
7	2.000	2.000	0	3.000	2.000
8	1.307	.857	0	.250	1.500
9	1.000	1.000	.333	0	-
10	.857	.833	0	1.000	1.000
11	.750	.666	.250	1.500	1.000
12	.833	.727	.142	.500	-
13	1.500	.555	1.200	-	-
14	.333	1.166	.500	-	-
15	.333	.428	0	-	-
16	2.000	1.000	0	-	-
17	-	2.000	-	-	-
18	-	-	0	1.000	-
19	-	-	-	-	-
20	-	-	-	-	-
Grand Mean	1.000	.896	.375	.750	1.250
% Change As No. Screenings Increase By One		-10%	-58%	+100%	+67%

Results for the Spanish-speaking [Table I(D)] do support Hypothesis 1 for screenings one-four with too few subjects having five screenings to place any confidence in this result. The referral rate for all repeat screenings is .720, a 32 percent reduction from the 1.054 recorded for initial screenings. The referral rate for all repeat screenings is thus lower than the rate for either blacks or whites. This is reflected in the Spanish-speaking having the lowest referral rate of the three groups at two, three and four screenings. At initial screening their rate is slightly higher than whites but lower than blacks. In summary, as evidenced by referral rates, the Spanish-speaking appear healthier than blacks or whites with blacks appearing to be the least healthy of the three groups.

In conclusion, race does not influence in general the trend of inverse relationship between referral rates and program exposure; however, it does appear to exert some influence on health status as evidenced by the varying magnitude of health problems found for racially different recipients with equal screenings. Particularly for blacks, the overall influence of race on referral rates appears to be meaningful. Over all screenings, blacks average 23 percent more referrals than whites and 35 percent more referrals than the Spanish-Speaking (1.107 versus .898 versus .817).

Tables I(E) and I(F) consider sex as a variable and show it exerting little influence on the outcome variable. With the exception of an upward turn in referrals at the fifth screening for males, Hypothesis 1 holds for both groups. The downward drift of referrals across screenings is similar for both sexes although somewhat sharper

Table I(D). Average number of referrals at last screening for long-term eligible Spanish-speaking by age and number of lifetime screenings.

Age	Number of Lifetime Screenings: 1	2	3	4	5	6
Under 1	1.000	0	-	0	-	-
1	1.250	1.000	-	-	-	-
2	.944	.666	-	-	-	-
3	1.040	.857	0	-	-	-
4	1.065	.631	.722	0	-	-
5	.975	1.026	.888	.667	0	-
6	1.333	.905	.838	.166	0	-
7	1.022	1.093	.555	.181	.600	-
8	1.128	.696	.551	.666	0	-
9	1.517	.456	.379	1.200	-	-
10	.957	.648	.647	.600	1.000	-
11	1.026	.761	.392	.545	-	1.000
12	1.138	.698	.875	.230	1.000	-
13	.892	.871	.454	.444	-	-
14	.642	.886	.909	.400	-	-
15	.900	.871	1.000	.750	-	-
16	.875	.692	.833	.833	-	-
17	.250	.588	1.125	-	1.000	-
18	1.000	1.000	1.666	.500	-	-
19	-	0	2.000	-	-	-
20	-	-	-	-	-	-
Grand Mean	1.054	.778	.679	.494	.533	1.000
% Change As No. Screenings Increase By One		-26%	-13%	-27%	+8%	+88%

for males. Males drop 30 percent in referrals from the initial screening to the average of all rescreenings (1.201 - .837/1.201) white females decrease 27 percent for the same comparison (1.169 - .854/1.169). Also, while males have 3 percent more referrals at initial screening (1.201 versus 1.169), they have 2 percent fewer referrals for all repeat screenings (.837 versus .854). All of these differences between the sexes are small.

The purpose of Tables I(G)-I(N) is to compare sex differences in outcome for each race under study. Tables I(G) and I(H) show white males have 4 percent more referrals at initial screening than females (1.059 versus 1.019) and 2.7 percent more referrals for all rescreenings combined (.789 versus .768). The direction of change across the number of screenings is very similar for both groups. The trend of slightly more referrals for males does not hold for blacks [Tables I(I)-I(J)]. Black males do have 2 percent more referrals at initial screening than black females (1.346 versus 1.315) but also have 2 percent fewer referrals for all rescreenings combined (.894 versus .943). With American-Indians [Tables I(K)-I(L)] there is again the problem of inadequate cell size. By combining data for all males and for all females for this group, somewhat over 100 subjects for each group is obtained. The overall referral rate thereby obtained is .842 for males; .814 for females, a 3 percent increase for males. For the Spanish-speaking [Tables I(M)-I(N)], the grand means for screenings 1-3 are each derived from over 100 subjects for both sexes and Hypothesis 1 is confirmed for both sexes across these three cells. The slope of decrease is different for the two

Table I(E). Average number of referrals at last screening for long-term eligible males by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	6
Under 1	1.113	1.222	-	0	-	-
1	1.201	.700	1.000	-	-	-
2	1.023	.763	1.666	0	0	-
3	1.194	.926	.812	1.333	2.000	-
4	1.350	.935	.982	.896	1.000	-
5	1.203	.992	.861	.806	1.230	0
6	1.250	.963	.736	.646	.684	.333
7	1.259	.933	.699	.699	.843	0
8	1.182	.893	.825	.495	.785	.500
9	1.192	.861	.674	.669	.647	.666
10	1.278	.865	.726	.784	.833	-
11	1.192	.893	.728	.745	.375	.333
12	1.116	.842	.711	.521	.642	1.000
13	1.142	.860	.830	.391	.500	1.000
14	1.141	.872	.741	.818	.400	-
15	1.080	.870	.743	.780	1.000	1.000
16	1.238	.939	.813	1.064	1.000	-
17	1.153	.932	.750	.600	.200	-
18	1.071	.900	.961	1.000	.500	-
19	2.153	1.000	.833	-	-	-
20	3.000	-	1.000	-	-	-
Grand Mean	1.201	.897	.763	.672	.747	.444
% Change As No. Screenings Increase By one		-25%	-15%	-12%	+11%	-41%

Table I(F). Average number of referrals at last screening for long-term eligible females by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
Under 1	1.012	0	-	-	-	-	-
1	1.072	.963	1.333	-	-	-	-
2	1.004	.814	.727	0	-	-	-
3	1.116	.940	.921	0	-	-	-
4	1.190	.914	.924	.730	2.000	-	-
5	1.144	.890	.847	.988	.357	2.000	-
6	1.186	.890	.731	.700	.875	0	1.000
7	1.117	.901	.771	.535	.782	0	-
8	1.192	.894	.768	.732	.611	0	0
9	1.130	.821	.718	.699	.473	-	-
10	1.174	.835	.707	.692	.692	0	-
11	1.128	.849	.787	.686	.933	-	-
12	1.246	.918	.793	.593	.333	0	-
13	1.204	.887	.797	.753	1.000	0	-
14	1.302	.958	.817	.850	.571	-	-
15	1.291	.992	.857	1.015	.666	2.000	-
16	1.238	.957	.921	.883	.500	-	-
17	1.292	1.112	.991	.777	1.000	-	-
18	1.542	1.081	.894	1.000	1.000	-	-
19	1.333	.959	1.060	1.400	1.000	-	-
20	1.000	1.166	.428	0	-	-	-
Grand Mean	1.169	.900	.797	.736	.691	.428	.500
% Change As No. Screenings Increased By One		-23%	-11%	-8%	-6%	-38%	+17%

Table I(G). Average number of referrals at last screening for long-term eligible white males by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	6	7
Under 1	.871	1.666	-	-	-	-	-
1	.948	.625	-	-	-	-	-
2	.995	.733	1.000	0	-	-	-
3	1.036	.893	.750	1.000	-	-	-
4	1.277	.885	.936	.800	1.000	-	-
5	1.096	1.039	.837	.812	1.667	0	-
6	1.136	.913	.767	.741	.666	.500	-
7	1.142	.840	.740	.732	.769	0	-
8	1.047	.816	.710	.546	.571	1.000	-
9	1.073	.802	.673	.483	.600	-	0
10	1.157	.811	.645	.770	.600	-	-
11	.997	.882	.616	.509	.400	0	-
12	.910	.793	.554	.585	.833	1.000	-
13	.911	.804	.782	.454	.600	-	-
14	.983	.803	.632	.555	.400	-	-
15	.814	.846	.648	.736	1.000	-	-
16	1.022	.804	.865	.750	-	-	-
17	.950	.935	.615	.800	0	-	-
18	.500	1.000	1.000	2.000	-	-	-
19	2.250	.250	-	-	-	-	-
20	3.000	-	-	-	-	-	-
Grand Mean	1.059	.850	.705	.637	.746	.375	0
% Change As No. Screenings Increased By One		-20%	-17%	-10%	+17%	-50%	-100%

Table I(H). Average number of referrals at last screening for long-term eligible white females by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	6	7
Under 1	.800	0	-	-	-	-	-
1	1.043	.909	1.000	-	-	-	-
2	.841	.697	.625	0	-	-	-
3	1.000	.887	1.000	-	-	-	-
4	1.081	.937	.792	.500	3.000	-	-
5	1.022	.857	.774	1.027	.333	-	-
6	1.149	.845	.777	.734	.571	0	-
7	1.078	.783	.585	.469	.800	0	-
8	1.063	.847	.708	.571	.375	0	0
9	.994	.702	.677	.596	.272	-	-
10	1.023	.768	.607	.489	.666	0	-
11	.947	.786	.747	.648	1.800	-	-
12	.995	.786	.676	.583	.571	0	-
13	.956	.769	.791	.457	1.000	0	-
14	1.035	.869	.793	.720	.750	-	-
15	1.024	.896	.721	.769	-	-	-
16	.893	.854	.826	1.333	.333	-	-
17	.960	.786	.969	.500	0	-	-
18	1.285	.538	.272	.666	1.000	-	-
19	1.500	1.200	1.200	-	-	-	-
20	2.000	0	-	-	-	-	-
Grand Mean	1.019	.811	.720	.629	.680	0	0
% Change As No. Screenings Increased By One		-20%	-11%	-13%	+8%	-100%	

Table I(I). Average number of referrals at last screening for long-term eligible black males by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
Under 1	1.301	1.200	-	-	-	-	-
1	1.417	.750	1.000	-	-	-	-
2	1.051	.825	2.333	0	-	-	-
3	1.332	.973	1.000	1.500	2.000	-	-
4	1.437	.983	1.038	1.076	-	-	-
5	1.304	.947	.883	.821	1.000	-	-
6	1.360	1.003	.707	.574	.785	0	-
7	1.387	1.021	.665	.645	.833	-	-
8	1.316	1.000	.969	.479	1.400	.333	-
9	1.323	.931	.712	.854	.666	-	1.000
10	1.431	.939	.818	.800	1.000	-	-
11	1.419	.920	.860	.945	0	-	-
12	1.331	.916	.830	.489	.333	-	-
13	1.324	.923	.872	.323	.428	1.000	-
14	1.318	.950	.824	1.027	-	-	-
15	1.301	.908	.798	.785	1.000	1.000	-
16	1.397	1.050	.783	1.352	1.000	-	-
17	1.256	.948	.754	.500	0	-	-
18	1.333	.823	1.055	.833	.500	-	-
19	2.111	2.000	.833	-	-	-	-
20	-	-	-	-	-	-	-
Grand Mean	1.346	.956	.822	.730	.762	.500	1.000
% Change As No. Screenings Increased By One		-29%	-14%	-11%	+4%	-34%	+100%

Table I(J). Average number of referrals at last screening for long-term eligible black females by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
Under 1	1.188	0	-	-	-	-	-
1	1.103	1.000	1.500	-	-	-	-
2	1.161	.886	1.000	0	-	-	-
3	1.218	1.000	1.000	0	-	-	-
4	1.324	.906	1.075	.928	1.000	-	-
5	1.270	.911	.918	1.000	.375	2.000	-
6	1.222	.944	.685	.732	1.125	-	1.000
7	1.169	.994	.975	.636	.769	-	-
8	1.339	.966	.841	.882	.714	-	-
9	1.259	.986	.777	.773	.750	-	-
10	1.334	.924	.812	.973	.666	-	-
11	1.316	.933	.865	.775	.500	-	-
12	1.510	1.073	.919	.692	0	-	-
13	1.400	1.000	.844	1.114	1.000	-	-
14	1.492	1.029	.831	1.000	.333	-	-
15	1.466	1.083	.944	1.222	.666	2.000	-
16	1.329	1.004	1.000	.733	.666	-	-
17	1.463	1.278	.975	.916	2.000	-	-
18	1.622	1.327	1.023	1.166	-	-	-
19	1.310	.953	.850	1.400	1.000	-	-
20	.857	1.400	.428	0	-	-	-
Grand Mean	1.316	.993	.875	.861	.682	2.000	1.000
% Change As No. Screenings Increased By One		-25%	-12%	-2%	-21%	+193%	-50%

Table I(K). Average number of referrals at last screening for long-term eligible American Indian males by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5
Under 1	0	-	-	-	-
1	.333	-	-	-	-
2	1.000	-	-	-	-
3	2.000	.500	-	-	-
4	1.000	1.000	1.000	-	-
5	1.250	-	.750	.500	-
6	1.000	1.166	0	-	0
7	2.000	0	0	3.000	2.000
8	1.833	.750	0	.250	-
9	1.500	1.000	0	0	-
10	.750	.500	0	-	1.000
11	1.000	2.000	0	1.500	1.000
12	.750	1.200	0	0	-
13	2.000	0	1.000	-	-
14	0	1.666	0	-	-
15	0	0	0	-	-
16	-	1.500	-	-	-
17	-	-	-	-	-
18	-	-	0	-	-
19	-	-	-	-	-
20	-	-	-	-	-
Grand Mean	1.128	.914	.250	.727	1.200
% Change As No. Screenings Increase By One		-19%	-73%	+191%	+65%

Table I(L). Average number of referrals at last screening for long-term eligible American Indian females by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
Under 1	-	-	-	-	-
1	-	-	-	-	-
2	-	-	-	-	-
3	1.000	-	-	-	-
4	0	.800	-	-	-
5	.800	1.333	.250	-	-
6	0	1.000	1.000	.500	1.000
7	2.000	2.500	0	-	-
8	.857	1.000	-	-	1.500
9	.666	1.000	1.000	-	-
10	1.000	1.500	0	1.000	-
11	.666	.500	.500	-	-
12	1.000	.333	.250	1.000	-
13	1.000	.714	1.333	-	-
14	1.000	.666	.750	-	-
15	.500	.600	0	-	-
16	2.000	.666	0	-	-
17	-	2.000	-	-	-
18	-	-	-	1.000	-
19	-	-	-	-	-
20	-	-	-	-	-
Grand Mean	.875	.884	.500	.800	1.333
% Change As No. Screenings Increase By One		+1%	-43%	+6%	+67%

Table I(M). Average number of referrals at last screening for long-term eligible Spanish-speaking males by age and number of lifetime screening.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	6
Under 1	1.500	0	-	0	-	-
1	4.000	-	-	-	-	-
2	1.000	0	-	-	-	-
3	.750	.777	0	-	-	-
4	1.230	.700	.875	0	-	-
5	1.235	1.055	.700	-	0	-
6	1.200	1.047	.818	.333	0	-
7	1.230	1.095	.666	0	.600	-
8	.947	.821	.631	0	0	-
9	1.437	.583	.166	1.333	-	-
10	.944	.758	.736	-	1.000	-
11	1.071	.600	.538	.666	-	1.000
12	1.142	.593	1.000	.333	1.000	-
13	.875	.757	.714	.500	-	-
14	.600	.740	1.000	.666	-	-
15	1.000	.714	1.000	1.000	-	-
16	.500	.363	.857	.500	-	-
17	.250	.750	.500	-	1.000	-
18	1.000	1.000	-	-	-	-
19	-	0	-	-	-	-
20	-	-	-	-	-	-
Grand Mean	1.098	.752	.719	.515	.538	1.000
% Change As No. Screenings Increase By One		-32%	-4%	-28%	+4%	+86%

Table I(N). Average number of referrals at last screening for long-term eligible Spanish-speaking females by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
Under 1	.750	-	-	-	-
1	.333	1.000	-	-	-
2	.857	1.000	-	-	-
3	1.176	1.000	0	-	-
4	.850	.555	.600	-	-
5	.782	1.000	1.125	.666	-
6	1.500	.812	.888	0	-
7	.722	1.090	.444	.250	-
8	1.300	.571	.400	.888	0
9	1.615	.363	.529	1.000	-
10	1.000	.520	.533	.600	1.000
11	1.000	.868	.266	.400	-
12	1.133	.806	.769	.200	-
13	.916	1.000	.263	.428	-
14	.666	1.038	.750	0	-
15	.888	1.055	1.000	0	-
16	1.000	.933	.800	1.000	-
17	-	.444	1.333	-	-
18	-	1.000	1.666	.500	-
19	-	0	2.000	-	-
20	-	-	-	-	-
Grand Mean	1.012	.802	.624	.484	.500
% Change As No. Screenings Increase By One		-21%	-22%	-22%	+3%

groups but the referral rate for all rescreenings is similar, .722 for males and .715 for females. The referral rate for initial screenings is 1.098 for males and 1.012 for females. These differences are small; sex appears to exert no unique effect on referral rates for the Spanish-speaking.

The most notable finding in Tables I(G)-I(N) is the implication that black males particularly need and benefit from EPSDT. Specifically, they have higher referral needs at initial screening than any racial/ethnic group members of either sex and show the largest decrease in referrals from the initial screening to rescreening (considering all rescreenings combined). The decrease is 34 percent (1.346 - .894/1.346), a very meaningful reduction.

Tables I(O)-I(Q) consider location as a factor. For both Detroit and outstate participants, the grand means for screenings 1-4 are based on sufficient subjects to place confidence in the results. For both groups, Hypothesis 1 is confirmed over this range of program participation. Location does not alter the relationship between referral rates and program participation. Also, the slope of decrease is very similar for both groups at screenings 2 and 3, with some notable, but still small, differences appearing only at screening 4. Overall, these results are remarkably similar.

What is striking in the location tables is the higher referral rates for Detroit residents. At initial screenings, Detroiters average <u>61</u> percent more referrals than outstate, rural residents (1.461 versus .908). This is a very large difference, particularly since other variables have yielded intergroup differences of generally only 2-4 percent.

Table I(O). Average number of referrals at last screening for long-term eligible participants in Detroit by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
Under 1	1.229	1.500	-	-	-	-	-
1	1.308	.833	1.333	-	-	-	-
2	1.322	1.000	-	-	-	-	-
3	1.305	1.323	1.571	1.000	2.000	-	-
4	1.518	1.081	1.360	.600	2.000	-	-
5	1.355	1.104	.887	1.000	.600	2.000	-
6	1.427	1.106	.607	.928	.714	-	-
7	1.337	1.114	1.126	.750	1.111	-	-
8	1.436	1.129	1.050	.812	1.600	.500	-
9	1.441	1.158	.932	1.066	2.000	-	1.000
10	1.505	1.168	1.057	1.000	.800	-	-
11	1.601	1.116	1.074	.875	-	-	-
12	1.549	1.281	1.203	.666	.666	-	-
13	1.537	1.107	.980	.642	0	-	-
14	1.588	1.236	1.172	1.090	1.000	-	-
15	1.593	1.217	1.046	1.100	-	-	-
16	1.787	1.336	1.275	1.285	1.000	-	-
17	1.578	1.302	1.368	1.500	0	-	-
18	1.800	1.600	1.555	2.000	0	-	-
19	1.470	1.187	1.333	1.000	-	-	-
20	1.000	2.000	1.000	-	-	-	-
Grand Mean	1.461	1.168	1.061	.936	.877	1.000	1.000
% Change As No. Screenings Increase By One		-20%	-9%	-12%	-6%	+14%	0%

Table I(P). Average number of referrals at last screening for long-term eligible participants in forty-four Northern Michigan counties by number of lifetime screenings.

	Number of Lifetime Screenings						
	1	2	3	4	5	6	7
Mean	.908	.711	.670	.640	.511	.083	0
% Change As No. Screenings Increase By One		-22%	-6%	-4%	-20%	-84%	-100%

In considering referral rates for all rescreenings combined, the gap increases as Detroit participants have 66 percent more referrals (1.133 versus .684). While location does not affect the program's effects, it is associated with a large difference in measured health status.

Since results have already shown blacks to have higher referral rates than whites, it might be anticipated that the Detroit-outstate difference in referrals is actually a racial difference. Table I(Qa) shows that blacks are the large majority of Detroit recipients (88 percent) while virtually all of the selected outstate participants are white (98 percent). However, further analysis suggests that location remains an influential factor when race is held constant as a variable ([Table I(Q)]. Urban whites have 33 percent more referrals than rural whites at the initial screening (1.186 versus .892) and 45 percent more referrals for all rescreenings combined (.991 versus .683). The insufficient number of outstate blacks prevents similar analysis of black referral rates, but the wide disparity in white rates argues that the difference obtained on the basis of location can not be explained by the racial composition of the population. The Table II series will further explore this relationship.

Table II Results

As discussed above, data for the Table II series were from recipients who were EPSDT eligible for a shorter time period than recipients included in the Table I series. Accordingly, we might expect fewer Table II subjects to have received a high number of multiple screenings,

Table I(Q). Average number of referrals at last screening for long-term eligible participants in Detroit and Northern Michigan by race and number of lifetime screenings.

Location/Race	Number of Lifetime Screenings 1	2	3	4	5	6	7	Grand Mean
Detroit								
Whites	1.186	1.000	.865	1.166	1.500	-	-	1.135
Blacks	1.506	1.193	1.075	.918	.822	1.000	1.000	1.382
Grand Mean	1.462	1.173	1.060	.936	.877	1.000	1.000	1.352
Northern Michigan								
Whites	.892	.706	.673	.640	.487	.100	0	.768
Blacks	.961	.571	.708	1.000	1.000	-	-	.772
Grand Mean	.893	.703	.674	.652	.512	.100	0	.768

a development which would restrict Hypothesis 1 analysis. Thus, it was anticipated long-term program effects might not be as evident with this group. On the other hand, the population of this group is much larger than that of the long-term eligibles so it was recognized this factor might serve to increase the number of recipients with rescreenings. Also, Table II data are more representative of the total AFDC population where a sizable proportion of clients have frequent changes in eligibility status. In actuality, it made little difference which population was reviewed. The results of both groups were similar although trends were somewhat more prominent in the Table II series.

In addressing Table II data, the questions are whether Hypothesis 1 is confirmed for this group, whether demographic variables affect the results and whether differences occur between Table I and Table II results. Discussion will proceed as in the presentation of the Table I series. The "Ns" for the Table II series are located in Appendix B.

For Table II, adequate cell size is present to warrant conclusions for screenings 1-5. For these screenings, perfect agreement with Hypothesis 1 exists across the grand means. As lifetime screenings increase, referrals decrease. Hypothesis 1 is confirmed even more strongly than was the case with Table I data. Rescreenings combined average .809 referrals, a decrease of 20 percent from the 1.009 referrals occurring at the initial screening. This is a strong change, consistent with the differences obtained for the long-term eligibles although of a somewhat lesser magnitude.

Tables II(A)-II(D) consider race as a variable. For both whites and blacks [Tables II(A)-II(B)], perfect agreement exists with

Table II. Average number of referrals at last screening for one-year eligibles by age and number of lifetime screenings.

Age	Number of Lifetime Screenings							
	1	2	3	4	5	6	7	8
Under 1	.745	.571	.937	.333	-	-	-	-
1	.790	.600	.594	1.285	-	-	-	-
2	.780	.664	.562	.581	.714	0	-	-
3	.962	.828	.793	1.041	.666	-	-	-
4	1.034	.797	.771	.732	.837	.800	-	-
5	1.074	.850	.766	.755	.666	.857	-	1.000
6	1.091	.863	.778	.717	.855	.166	1.000	-
7	1.088	.851	.754	.665	.662	.200	-	-
8	1.128	.856	.778	.639	.695	.285	2.000	-
9	1.085	.837	.722	.691	.580	.666	-	-
10	1.139	.844	.716	.725	.692	0	-	-
11	1.121	.850	.737	.691	.894	.333	-	-
12	1.124	.880	.763	.629	.416	-	-	-
13	1.140	.863	.822	.638	.615	.333	-	-
14	1.219	.899	.823	.739	.466	1.000	-	-
15	1.186	.947	.785	.909	.913	.666	-	-
16	1.243	.949	.869	.940	.615	-	-	-
17	1.235	1.016	.913	.717	.461	-	-	-
18	1.272	1.152	.858	.947	.400	1.000	-	-
19	1.208	1.083	.965	.933	1.000	-	-	-
20	1.081	1.104	.565	.333	.500	-	-	-
Grand Mean	1.009	.837	.767	.717	.641	.470	1.000	1.000
% Change As No. Screenings Increase By One		-17%	-8%	-7%	-10%	-27%	+112%	0%

Table II(A). Average number of referrals at last screening for one-year eligible whites by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	8
Under 1	.673	.489	.600	-	-	-	-	-
1	.678	.550	.512	3.000	-	-	-	-
2	.712	.649	.505	.388	0	0	-	-
3	.920	.835	.704	.903	.500	-	-	-
4	.965	.778	.731	.666	.875	.750	-	-
5	.985	.830	.752	.715	.742	.666	-	1.000
6	1.011	.824	.801	.764	.857	.250	-	-
7	1.004	.792	.727	.668	.533	.200	-	-
8	1.046	.806	.711	.625	.391	.250	0	-
9	.990	.775	.701	.598	.375	-	0	-
10	1.038	.765	.661	.616	.666	0	-	-
11	.990	.807	.708	.598	1.190	0	-	-
12	.983	.848	.679	.666	.500	.500	-	-
13	.989	.818	.821	.557	.600	0	-	-
14	1.065	.856	.782	.571	.500	-	-	-
15	1.031	.924	.694	.774	1.000	-	-	-
16	1.013	.841	.855	1.060	.200	-	-	-
17	1.090	.929	.950	.823	.200	-	-	-
18	1.200	1.046	.666	.900	0	1.000	-	-
19	1.098	1.064	1.125	.200	-	-	-	-
20	1.131	.642	.800	-	1.000	-	-	-
Grand Mean	.918	.795	.727	.669	.655	.312	0	1.000
% Change As No. Screenings Increase By One		-13%	-9%	-8%	-2%	-52%	-100%	+100%

Table II(B). Average number of referrals at last screening for one-year eligible blacks by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
Under 1	.836	.670	1.090	.500	-	-	-
1	.933	.686	.714	.600	-	-	-
2	.877	.675	.622	.720	1.000	-	-
3	1.036	.831	.929	1.209	.750	-	-
4	1.180	.830	.804	.834	.764	1.000	-
5	1.209	.884	.796	.814	.633	1.333	-
6	1.226	.927	.769	.707	.900	0	1.000
7	1.239	.935	.826	.680	.800	-	-
8	1.262	.937	.898	.669	1.176	.333	1.000
9	1.224	.946	.784	.802	.727	-	1.000
10	1.325	.971	.788	.862	.666	-	-
11	1.324	.925	.815	.783	.500	-	-
12	1.342	.945	.869	.600	.214	1.000	-
13	1.340	.933	.840	.744	.636	1.000	-
14	1.424	.973	.858	.927	.333	-	-
15	1.375	.981	.867	1.027	.727	1.500	-
16	1.470	1.047	.900	.900	.857	-	-
17	1.378	1.127	.897	.730	.666	-	-
18	1.377	1.236	.956	1.090	.500	-	-
19	1.296	1.117	.836	1.333	1.000	-	-
20	.951	1.289	.437	.333	0	-	-
Grand Mean	1.146	.905	.832	.791	.725	.846	1.000
% Change As No. Screenings Increase By One		-21%	-7%	-5%	-8%	+17%	+18%

Hypothesis 1 across screenings 1-5. This is consistent with the Table I findings, with the trend even somewhat stronger. Whites average .769 referrals for all rescreenings, a drop of 16 percent from initial screenings; blacks average .876 on rescreenings, a decrease of 23.5 percent from the initial level of 1.146. As with the long-term eligibles, blacks show a higher rate of problems than whites at initial screening (20 percent higher, 1.146 versus .918) and a greater reduction in problems at rescreening (all rescreenings considered). For both American-Indians and the Spanish-speaking, the trend of perfect agreement with Hypothesis 1 continues across those cells with over 100 subjects. For American-Indians, screenings one-three show the predicted downward trend. Rescreenings average .729 referrals versus .898 referrals for initial screenings, a 19 percent decrease. The Spanish-speaking referral rate decreases over screenings 1-4. Here, rescreenings average .736 referrals or 20 percent less than the initial screening rate of .923.

In short, the perfect agreement with Hypothesis 1 over all subjects in this population (Table II) is not disturbed when race becomes a factor [Tables II(A)-II(D)]. That is, race is not a sufficiently strong variable to disturb the general pattern of relationship, given sufficient study group size. This latter qualification is key. If group size is large, referral rates are affected as predicted by the degree of program participation, i.e. the number of screenings one has received. Perhaps, since there are more short-term eligibles than long-term ones, the predicted relationship of Hypothesis 1 is stronger with the former group. This is not to say racial differences do not appear to

Table II(C). Average number of referrals at last screening for one-year eligible American Indians by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	6
Under 1	.750	1.000	-	-	-	-
1	.964	.666	-	-	-	-
2	.540	.272	4.000	-	-	-
3	1.087	.888	1.500	-	-	-
4	.739	.535	1.000	2.500	-	-
5	.851	1.176	.363	.400	-	0
6	1.263	.941	.400	.666	.500	-
7	1.333	1.315	.307	2.000	2.000	-
8	1.166	1.157	.600	.600	1.500	-
9	.941	.833	.642	.600	2.000	-
10	.681	.578	.700	1.666	1.000	-
11	.857	.666	.166	1.500	1.000	-
12	.588	.851	.300	.500	-	-
13	1.214	.750	1.000	-	-	-
14	.700	.750	.333	-	-	-
15	.600	.538	0	-	2.000	-
16	1.200	.833	0	-	-	-
17	1.000	1.000	0	-	0	-
18	0	1.500	.333	.500	-	-
19	1.000	1.000	.500	-	-	-
20	2.000	-	-	-	-	-
Grand Mean	.898	.816	.545	1.000	1.272	0
% Change As No. Screenings Increase By One		-9%	-33%	+83%	+27%	

Table II(D). Average number of referrals at last screening for one-year eligible Spanish-speaking by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	6
Under 1	.569	.450	-	0	-	-
1	.764	.442	.400	-	-	-
2	.872	.817	.384	-	-	-
3	.712	.676	.652	1.000	-	-
4	.877	.833	.914	.500	1.000	-
5	1.095	.783	.687	.875	.250	-
6	1.096	.825	.704	.444	.500	-
7	.948	.878	.563	.440	.600	-
8	1.032	.786	.584	.625	0	-
9	1.348	.669	.467	.777	.666	-
10	.895	.813	.716	.833	1.000	-
11	.932	.755	.483	.600	.500	1.000
12	1.106	.721	.702	.571	1.000	-
13	1.046	.808	.611	.500	-	-
14	1.059	.836	.926	.500	-	1.000
15	1.109	.890	.920	.888	-	-
16	.892	.830	.714	.714	1.000	-
17	1.071	.600	.875	0	1.000	-
18	1.125	1.200	1.000	.666	-	-
19	1.461	.625	1.800	1.000	-	-
20	.500	7.000	1.000	-	-	-
Grand Mean	.923	.776	.680	.622	.571	1.000
% Change As No. Screenings Increase By One		-16%	-12%	-9%	-8%	+75%

exist on the outcome variable. When referral rates are calculated across all screenings for all racial groups, the results are ordered as follows: blacks, 1.022 referrals; whites, .850 referrals; American-Indians, .821 referrals and Spanish-speaking .815 referrals. The major contrast is between blacks and all other groups. Blacks have 20 percent more referrals than whites, 24 percent more than American-Indians and 25 percent more than the Spanish-speaking.

With sex as a variable [Tables II(E)-II(F)], the Hypothesis 1 trend is consistent across screenings 1-5, with a single exception. For males with five screenings, there is a small (3%) increase in referrals as compared with males who have had four screenings. This upswing does not occur with females, where, on the contrary, there is a 24 percent decrease in referrals from the fourth to fifth screening. The reason for the male increase is not apparent but closer observation of the table discloses it occurs chiefly at ages 5, 6, 8 and 10 with additional influence from ages 13 and 15. This same upward movement occurred in Table I and these same ages were responsible for that increase. A factor peculiar to these ages may be responsible but this occurrence should not be overemphasized since the rate at five screenings is still lower than occurs at screenings 1-3, as again was the case with Table I. While referral rates are very similar for both sexes, females do have 6 percent more referrals when all rescreenings are considered as a group (.813 versus .764). Referral differences by sex do not appear to be meaningful in this study.

Tables II (G)-II(N) present outcomes for each sex, by race. As with the Table I series, few strong differences are obtained.

Table II(E). Average number of referrals at last screening for one-year eligible males by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
Under 1	.752	.633	.916	0	-	-	-
1	.823	.612	.517	0	-	-	-
2	.815	.695	.543	.636	1.000	0	-
3	1.008	.894	.823	1.142	.750	-	-
4	1.078	.804	.791	.789	.760	.333	-
5	1.114	.888	.786	.755	.888	.333	-
6	1.114	.865	.798	.726	.871	.333	-
7	1.132	.856	.752	.709	.681	.250	-
8	1.117	.867	.781	.565	.727	.500	1.000
9	1.107	.858	.681	.675	.565	.666	-
10	1.181	.846	.724	.716	.875	0	-
11	1.139	.851	.732	.737	.461	.333	-
12	1.070	.855	.705	.611	.611	1.000	-
13	1.098	.840	.807	.484	.500	.500	-
14	1.159	.883	.741	.772	.400	1.000	-
15	1.095	.910	.703	.843	.933	1.000	-
16	1.182	.904	.827	.978	.800	-	-
17	1.108	.953	.739	.590	.500	-	-
18	1.208	.857	.750	.700	.500	-	-
19	1.636	1.000	.625	.500	-	-	-
20	2.333	4.333	1.000	-	-	-	-
Grand Mean	1.018	.774	.753	.711	.730	.451	1.000
% Change As No. Screenings Increased By One		-24%	-3%	-6%	+3%	-38%	+122%

Table II(F). Average number of referrals at last screening for one-year eligible females by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	8
Under 1	.739	.507	1.000	.500	-	-	-	-
1	.757	.589	.675	1.500	-	-	-	-
2	.746	.632	.585	.523	.333	-	-	-
3	.916	.762	.764	.902	.500	-	-	-
4	.992	.790	.753	.677	.944	1.500	-	-
5	1.032	.811	.745	.754	.424	1.250	-	1.000
6	1.069	.863	.761	.708	.833	0	1.000	-
7	1.045	.847	.757	.627	.636	0	-	-
8	1.140	.846	.774	.721	.666	0	0	-
9	1.064	.817	.761	.711	.592	-	-	-
10	1.099	.843	.708	.736	.565	0	-	-
11	1.105	.849	.743	.634	1.120	-	-	-
12	1.178	.904	.822	.647	.222	0	-	-
13	1.179	.886	.837	.765	.750	0	-	-
14	1.269	.916	.901	.705	.500	-	-	-
15	1.250	.978	.864	.962	.875	2.000	-	-
16	1.277	.982	.905	.907	.500	-	-	-
17	1.286	1.048	1.034	.833	.400	-	-	-
18	1.277	1.220	.895	1.035	.333	1.000	-	-
19	1.187	1.090	1.000	1.000	1.000	-	-	-
20	1.017	.953	.545	.333	.500	-	-	-
Grand Mean	1.002	.836	.782	.725	.550	.500	1.00	1.000
% Change As No. Screenings Increase By One		-17%	-6%	-7%	-24%	-9%	+100%	0%

Tables II(G)-II(H) show white males have 2 percent more referrals than white females at initial screening (.928 versus .908) and 7 percent more at rescreening (.819 versus .862). Also, white male referrals decrease less than female referrals from initial screening to rescreening. Males decrease 12 percent; females decrease 16 percent. Among whites, females thus exhibit a consistent, but small, superiority on outcomes. This difference is not present when all participant responses are considered by sex, irrespective of race. Also, this trend does not hold for blacks [Tables II(I)-II(J)]. While black males have a 2 percent higher referral rate at initial screening, their rescreening referral rate is 4 percent lower than that of females (1.158 versus 1.136 for initial screenings; .856 versus .893 on rescreenings - males and females respectively. Black males thus drop 26 percent on referrals from initial screening to rescreening (1.158 - .856/1.158) and black females decrease 21 percent (1.136 - . 893/1.136). The comparable decreases for whites were 12 percent for males (.928 - .819/.928) and 16 percent for females (.908 - .762/.908). These changes by blacks are the largest of any racial group. Black males, as in Table I, show the most response to the program as evidenced by the best improvement in referral rate.

Neither American-Indians or the Spanish-speaking follow the black trend or show equally high levels of referral need. American-Indian females have 9 percent more referrals than males at initial screening and 12 percent more referrals at rescreening [Tables II(K)-II(L)]. These higher referral rates for American-Indian females are of interest.

Table II(G). Average Number of referrals at last screening for one-year eligible white males by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
Under 1	.664	.596	.500	-	-	-	-
1	.698	.572	.359	-	-	-	-
2	.748	.664	.461	.285	0	0	-
3	.968	.897	.696	.966	.500	-	-
4	1.001	.786	.745	.761	.538	.333	-
5	1.024	.874	.788	.693	.950	.500	-
6	1.019	.816	.825	.816	1.000	.500	-
7	1.047	.814	.793	.752	.520	.250	-
8	1.011	.814	.663	.623	.461	1.000	-
9	1.017	.813	.674	.541	.333	-	0
10	1.093	.773	.664	.711	.875	0	-
11	1.004	.833	.665	.642	.555	0	-
12	.956	.845	.612	.655	.857	1.000	-
13	.967	.811	.788	.600	.571	0	-
14	1.042	.883	.652	.609	.400	-	-
15	.961	.916	.631	.777	.777	-	-
16	1.018	.845	.916	.888	0	-	-
17	1.000	1.036	.617	.888	.333	-	-
18	1.041	.760	.600	.666	-	-	-
19	2.000	.625	0	.500	-	-	-
20	2.250	-	-	-	-	-	-
Grand Mean	.928	.811	.710	.695	.666	.333	0
% Change As No. Screenings Increased By One		-13%	-12%	-2%	-4%	-50%	-100%

Table II(H). Average number of referrals at last screening for one-year eligible white females by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	8
Under 1	.683	.365	1.000	-	-	-	-	-
1	.657	.526	.684	3.000	-	-	-	-
2	.675	.631	.552	.454	0	-	-	-
3	.872	.773	.711	.818	-	-	-	-
4	.930	.769	.717	.567	1.272	2.000	-	-
5	.942	.783	.713	.737	.466	1.000	-	1.000
6	1.004	.832	.778	.704	.642	0	-	-
7	.959	.771	.658	.581	.550	0	-	-
8	1.082	.799	.762	.627	.300	0	0	-
9	.962	.738	.727	.666	.400	-	-	-
10	.982	.756	.658	.492	.538	0	-	-
11	.976	.784	.752	.547	1.666	-	-	-
12	1.020	.851	.745	.676	.307	0	-	-
13	1.011	.825	.852	.518	.625	0	-	-
14	1.086	.829	.909	.534	.571	-	-	-
15	1.084	.931	.751	.771	2.000	-	-	-
16	1.010	.838	.810	1.266	.250	-	-	-
17	1.121	.861	1.164	.750	0	-	-	-
18	1.213	1.116	.689	1.000	0	1.000	-	-
19	1.073	1.115	1.173	0	-	-	-	-
20	1.069	.642	.800	0	1.000	-	-	-
Grand Mean	.908	.779	.746	.643	.644	.285	0	1.000
% Change As No. Screenings Increase By One		-14%	-4%	-14%	0%	-56%	-100%	+100%

Table II(I). Average number of referrals at last screening for one-year eligible black males by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
Under 1	.864	.676	1.125	-	-	-	-
1	.975	.692	.766	0	-	-	-
2	.911	.721	.643	.800	1.333	-	-
3	1.087	.898	.988	1.375	1.000	-	-
4	1.245	.836	.822	.870	1.000	-	-
5	1.256	.918	.804	.883	1.000	-	-
6	1.284	.932	.794	.673	.812	0	-
7	1.278	.917	.713	.626	.833	-	-
8	1.284	.951	.958	.515	1.666	.333	1.000
9	1.245	.932	.711	.831	.714	-	1.000
10	1.360	.970	.800	.722	.833	-	-
11	1.354	.896	.836	.867	0	-	-
12	1.266	.882	.794	.517	.333	1.000	-
13	1.278	.888	.823	.333	.428	1.000	-
14	1.343	.903	.813	.930	-	-	-
15	1.266	.898	.784	.843	1.000	1.000	-
16	1.361	.987	.794	1.120	1.000	-	-
17	1.224	.920	.788	.500	.500	-	-
18	1.500	.909	.904	.714	.500	-	-
19	1.533	1.428	.833	-	-	-	-
20	2.000	3.000	-	-	-	-	-
Grand Mean	1.158	.888	.808	.746	.823	.571	.666
% Change As No. Screenings Increased By One		-23%	-9%	-8%	+10%	-31%	+17%

Table II(J). Average number of referrals at last screening for one-year eligible black females by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
Under 1	.807	.664	1.000	.500	-	-	-
1	.889	.680	.666	.750	-	-	-
2	.843	.628	.602	.600	.500	-	-
3	.982	.763	.869	1.000	.500	-	-
4	1.118	.825	.788	.803	.428	1.000	-
5	1.162	.849	.788	.760	.388	1.333	-
6	1.166	.923	.746	.742	1.000	0	1.000
7	1.200	.954	.931	.723	.769	-	-
8	1.238	.923	.835	.818	.909	-	-
9	1.204	.960	.857	.771	.750	-	-
10	1.290	.971	.777	1.020	.555	-	-
11	1.297	.953	.796	.673	.583	-	-
12	1.414	1.005	.951	.685	0	-	-
13	1.391	.977	.858	1.076	1.000	-	-
14	1.482	1.032	.899	.925	.333	-	-
15	1.441	1.047	.950	1.170	.500	2.000	-
16	1.526	1.090	1.000	.742	.750	-	-
17	1.450	1.214	.974	.875	1.000	-	-
18	1.367	1.305	.971	1.266	.500	-	-
19	1.279	1.099	.836	1.333	1.000	-	-
20	.925	1.194	.437	.333	0	-	-
Grand Mean	1.136	.921	.848	.830	.637	1.166	1.000
% Change As No. Screenings Increased By one		-19%	-8%	-2%	-23%	+83%	-14%

Table II(K). Average Number of referrals at last screening for one-year eligible American Indian males by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	6
Under 1	.533	-	-	-	-	-
1	.769	.800	-	-	-	-
2	.569	.166	-	-	-	-
3	.933	.777	1.666	-	-	-
4	1.272	.615	1.333	1.000	-	-
5	.750	1.166	.428	.500	-	0
6	1.066	.900	.250	1.000	0	-
7	.875	1.166	.222	2.000	2.000	-
8	1.615	1.100	.666	.250	-	-
9	.900	.750	.500	.333	-	-
10	.750	.545	1.000	-	1.000	-
11	.833	.857	0	1.000	1.000	-
12	.461	.875	.250	0	-	-
13	1.142	.600	.500	-	-	-
14	.750	.875	0	-	-	-
15	.666	.500	0	-	2.000	-
16	-	1.142	0	-	-	-
17	1.000	.500	0	-	-	-
18	-	-	.333	-	-	-
19	-	-	0	-	-	-
20	-	-	-	-	-	-
Grand Mean	.860	.806	.514	.705	1.333	0
% Change As No. Screenings Increase By One		-6%	-36%	+37%	+89%	-100%

Table II(L). Average number of referrals at last screening for one-year eligible American Indian females by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
Under 1	1.000	1.000	-	-	-
1	1.133	.571	-	-	-
2	.550	.400	4.000	-	-
3	1.375	1.000	1.000	-	-
4	.250	.466	.600	4.000	-
5	1.000	1.181	.250	.333	-
6	2.000	1.000	.500	.500	1.000
7	1.700	1.384	.500	-	-
8	.823	1.222	.500	2.000	1.500
9	1.000	.875	.750	1.000	2.000
10	.600	.625	0	1.666	-
11	.875	.545	.250	2.000	-
12	1.000	.818	.333	1.000	-
13	1.285	.818	1.333	-	-
14	.666	.500	.400	-	-
15	.500	.555	0	-	-
16	1.200	.400	0	-	-
17	1.000	1.500	0	-	0
18	0	1.500	-	.500	-
19	1.000	1.000	1.000	-	-
20	2.000	-	-	-	-
Grand Mean	.939	.832	.578	1.277	1.200
% Change As No. Screenings Increase By One		-11%	-31%	+121%	-6%

Table II(M). Average number of screenings at last screening for one-year eligible Spanish-speaking males by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	6
Under 1	.603	.636	-	0	-	-
1	.928	.400	0	-	-	-
2	.954	.860	.500	-	-	-
3	.561	.800	.722	1.000	-	-
4	.826	.785	1.030	.500	1.000	-
5	1.184	.800	.571	.750	.250	
6	.947	.880	.666	.250	0	-
7	1.081	.936	.702	.400	.600	-
8	.969	.785	.750	.300	0	-
9	1.368	.745	.518	1.000	-	-
10	.781	.764	.724	.750	1.000	-
11	.894	.569	.695	.555	0	1.000
12	1.166	.745	.846	1.000	1.000	-
13	1.093	.774	.869	.666	-	-
14	1.000	.735	.916	.750	-	1.000
15	1.200	.857	.636	1.200	-	-
16	.500	.631	.625	.333	1.000	-
17	.800	.700	.600	0	1.000	-
18	1.000	1.000	.500	-	-	-
19	-	0	-	-	-	-
20	-	7.000	-	-	-	-
Grand Mean	.929	.766	.724	.635	.523	1.000
% Change As No. Screenings Increase By One		-18%	-5%	-12%	-18%	+91%

Table II(N). Average number of referrals at last screening for one-year eligible Spanish-speaking females by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
Under 1	.536	.222	-	-	-
1	.591	.500	1.000	-	-
2	.800	.767	.285	-	-
3	.850	.553	.607	-	-
4	.931	.882	.810	.500	-
5	1.000	.766	.827	1.000	-
6	1.276	.789	.758	.600	1.000
7	.790	.838	.411	.450	-
8	1.100	.786	.379	.857	0
9	1.326	.600	.428	.428	.666
10	1.000	.863	.709	.875	1.000
11	.967	.918	.351	.666	1.000
12	1.037	.696	.523	.307	-
13	1.000	.844	.419	.444	-
14	1.100	.941	.941	0	-
15	1.033	.935	1.142	.500	-
16	1.000	.941	.833	1.000	-
17	1.222	.560	1.000	-	-
18	1.142	1.250	1.250	.666	-
19	1.461	.714	1.800	1.000	-
20	.500	-	1.000	-	-
Grand Mean	.918	.785	.637	.611	.714
% Change As No. Screenings Increase By One		-14%	-19%	-4%	+17%

Female Indian rates are actually second only to blacks and these rates are not consistent with Table I findings. In Table I, American-Indian males had 3 percent more referrals than females, all referrals considered, while in Table II American-Indian females have 10 percent more referrals for the same comparison (.860 veruss .782). With the Spanish-speaking, the trend is reversed but with only minor differences [Tables II(M)-II(N)]. Males have 1 percent more referrals at first screening; 2 percent more at rescreening. Both Spanish-speaking males and females show a 20 percent decrease in referrals from initial screening to rescreenings combined.

In summary, outcomes for Tables II(G)-II(N) are generally very similar to those obtained for the companion Tables I(G)-I(N). The two population groups under study, shorter and longer-term eligibles, exhibit similar patterns in referral rates when both sex and race are variables. American-Indians are an exception to this generalization. The existence of the inverse relationship between referral rates and extent of program participation - which holds across all participants (Table II) - is little affected when results are divided by sex for each race. If grand means are based on 100 or more subjects (96 subjects for Spanish-speaking males with 5 screenings), Hypothesis 1 is confirmed in all cases, except one. For whites of both sexes, the downward trend exists across screenings 1-5 (although rates at screenings 4 and 5 are virtually identical for white females). For black males and females, the trend exists across screenings 1-5, except for males at 5 screenings. For the Spanish-speaking, the trend covers screenings 1-4 for both sexes. For American-Indians, the trend encompasses screenings 1-2.

The exception to this consistent, inverse relationship is black males where there is a 10 percent increase in referrals from the fourth to fifth screening. This is consistent with the data at fifth screening for all males, and indeed largely explains that upturn since only black males show this trend. Also, the same ages primarily responsible for the outcome for all males (ages 5, 6, 8 and 10), are also responsible for the differences with blacks.

The location factor is considered in Tables II(O)-II(Q) with results similar to those obtained in the Table I series. Screenings 1-4 in Tables II)O)-II(P) are based on a sufficient number of subjects to place confidence in the obtained results. For both Detroit and rural, outstate residents, the Hypothesis 1 relationship holds across the first four screenings, i.e. location does not alter the relationship. Furthermore, the slope of inverse relationship is remarkably similar for both groups. It decreases across screenings 1-4 by 14%, 4% and 7% for Detroiters and 11%, 3% and 7% for outstaters. The second striking result is that the city residents have a higher referral rate. Detroiters have 61 percent more referrals at the initial screening (1.255 versus .781) and 56 percent more referrals when all rescreening results are averaged (1.066 versus .684). Over all screenings, Detroiters average 64 percent more referrals than the outstate residents (1.202 versus .732).

As with the Table I series, further analysis shows that location remains an influential factor even when race is controlled as a variable [Table II(Q)]. Urban whites have 39 percent more referrals than rural

Table II(O). Average number of referrals at last screening for one-year eligible participants in Detroit by number of lifetime screenings.

	Number of Lifetime Screenings						
	1	2	3	4	5	6	7
Mean	1.255	1.081	1.039	.971	.815	1.000	1.000
% Change As No. Screenings Increase By One		-14%	-4%	-7%	-16%	+23%	0%

*Since the amount of computer space needed to breakdown group means by age was prohibitive it was possible to present group means only for this table.

Table II(P). Average number of referrals at last screening for one-year eligible participants in forty-four Northern Michigan counties by number of lifetime screenings.

	Number of Lifetime Screenings						
	1	2	3	4	5	6	7
Mean	.781	.698	.676	.630	.525	.176	.333
% Change As No. Screenings Increase By One		-11%	-3%	-7%	-17%	-66%	+89%

whites (1.061 versus .735). Comparisons with blacks show similar results. Detroit blacks average 1.293 referrals at initial screenings; outstate, rural blacks average .705 referrals. This is a difference of 83 percent more referrals for Detroit blacks. For all rescreenings combined, Detroit blacks average 1.086 referrals; outstate blacks average .569 referrals. On this comparison, Detroit blacks have 91 percent more referrals. Over all screenings, Detroit blacks have 96 percent more referrals (1.232 versus .628).

These location differences are very large and suggest location, as defined in this study, does indeed play a large role in determining the rate of referrals. It is also noteworthy that the location differential is greater for blacks than for whites. Rural blacks have about half as many referrals as urban blacks (.628 versus 1.232) while rural whites have nearly 70 percent as many referrals as urban whites (7.35 versus 1.061). This is but another way of saying that rural blacks have a lower referral rate than either rural or urban whites. This is an unexpected finding and clearly runs counter to this study's general finding of higher referral rates for blacks. Looked at from this perspective, it appears race does exert an influence even though it does not explain the difference in outcome by location.

In summarizing Tables I and II, the most noteworthy results are as follows:

(1). Hypothesis 1 is generally confirmed where results are based on a sufficiently large number of subjects (100 or more).

(2). Demographic factors do not invalidate, or distort, the

Table II(Q). Average number of referrals at last screening in Detroit and Northern Michigan by race and number of lifetime screenings.

Location/Race	Number of Lifetime Screenings 1	2	3	4	5	6	7	Grand Mean
Detroit								
Whites	1.090	.973	.873	1.136	1.400	-	-	1.061
Blacks	1.293	1.104	1.059	.952	.750	1.000	1.000	1.232
Grand Mean	1.262	1.087	1.044	.966	.794	1.000	1.000	1.208
Northern Michigan								
Whites	.783	.699	.683	.628	.478	.125	0	.735
Blacks	.705	.487	.688	.555	1.000	-	1.000	.628
Grand Mean	.781	.695	.683	.625	.492	.125	.333	.732

Hypothesis 1 relationship.

(3). Location and (for blacks) race do exert a meaningful influence on the outcome variable even though they do not alter the inverse relationship between referral rates and number of lifetime screenings. Blacks and urban residents generally have higher referral rates than whites and rural, outstate residents respectively. An interesting, and seemingly meaningful, exception to this general trend is the lower referral rate for rural blacks. Also, there is some indication that black males respond unusually well to the program, as evidenced by their relatively large decrease in referrals from initial screening to rescreening.

(4). Differences between long and shorter-term eligibles seem few and are likely the result of unreliable data stemming from study group size rather than characteristics of the population.

Although, as shown above, Tables I and II do confirm Hypothesis 1, some qualification and reanalysis is warranted since the obtained data can also be arranged to show that history has exerted an influence on referral rates. History's role is itself an interesting finding but indicates some overestimation of the strength of the Hypothesis 1 relationship has occurred in the Tables analyzed thus far. Again, the original expectation was that overestimation would most likely occur at third, fourth and fifth screenings since these occurred later in the program's history when referrals were given less frequently.

History would thereby act to strengthen and confound the Hypothesis 1 relationship. However, data below show the influence did not work quite as anticipated and although history does exert an influence, it does not invalidate Hypothesis 1. The following four tables establish these points:

Table I(R) succinctly shows two important findings of this study: (1) the effect of history and (2) the validity of Hypothesis 1 despite history's confounding influence. History's influence can be seen by direct observation of the columns. For each lifetime screening, referrals rates generally decrease as one descends the column, i.e. as the program ages. The descent is not perfect as in each column there is one year in which rates increase over the previous year. However, the general trend is clear. This trend is unequivocal in the grand mean column. Between 1973 and 1980, the referral rate decreased 59 percent (1.483 - .609/1.483). Between 1974 and 1979, the decrease was 44 percent (1.382 - .774/1.382).

These are strong changes and occur consistently each year. An influential factor must be operative to so consistently and markedly depress the rate. In the past five years, the overall rate has decreased nearly 50 percent (11180 - .609/11180 = 49%).

Despite this strong effect of history, referral rates and degree of program participation maintain a clear inverse relationship. This can be seen by observation of the rows (years) where history is controlled. In each row, except one, referrals decrease as the number of lifetime screenings increase. The single exception occurs in moving from 3 to 4 screenings in 1980. The upturn is not large and it is

Table I(R). Average number of referrals at last screening for long-term eligibles by number and year of screening ($n \geq 100$).

Year	Number of Lifetime Screenings: 1	2	3	4	5	Grand Mean
1973	1.483					1.483
1974	1.390	1.142				1.382
1975	1.219	1.025				1.180
1976	1.067	.919	.794			1.003
1977	1.008	.947	.877	.715		.957
1978	1.036	.884	.868	.765		.908
1979	.870	.825	.703	.698	.696	.774
1980	.773	.687	.521	.550		.609
Grand Mean	1.185	.898	.777	.708	.696	

noteworthy that the rate at four screenings is based on only 140 subjects, not many over the minimum deemed necessary to obtain valid results.

Further analysis of the change in Table I(R) is given in Table I(S). This shows the percent change in referral rates as the number of screenings increase by one. The comparison to make is the change in each year to the grand mean change of Table I where year of screening was not held constant. In noting the decrease in referral rates between one and two screenings, for the entire table, it can be seen that actual change, by year, is less than the grand mean decrease of 24 percent. This most clearly shows the effect of history in overestimating the decreasing relationship. The average decrease from screening one to screening two, for years 1974-1980, is 12 percent, or half of the grand mean change. The average change for movement between screenings 2 and 3 is -12 percent, or only one percent less than the grand mean change.

The average change between screenings 3 and 4 is -6.25 percent as compared with the grand mean change of -9 percent. Overall, with history controlled, the reduction in grand mean rates is about 2/3 of the decrease shown in Table I (.12 + .12 + .0625/.24 + .13 + .09).

Tables II(R) and II(S) support the findings of the Table I series. Again, with a few exceptions, each column in Table II(R) shows a decrease in referrals as the years pass. For the grand mean column, there is a consistent decrease. Between 1973 and 1980, the decrease in grand means was 59 percent (1.476 - .603/1.476). Between 1975 and 1979, the decrease was 33 percent (1.120 - .747/1.120). In the

Table I(S). Percent change in average number of referrals at last screening as number of lifetime screenings increase by one for long-term eligibles by year of screening ($n \geq 100$).

	Change in Number of Lifetime Screenings			
Year	1-2	2-3	3-4	4-5
1974	-18%			
1975	-16%			
1976	-14%	-14%		
1977	-6%	-7%	-18%	
1978	-15%	-2%	-12%	
1979	-5%	-15%	-1%	0%
1980	-11%	-24%	+6%	
Grand Mean*	-24%	-13%	-9%	+2%

* Grand Mean change is taken from Table I.

Table II(R). Average number of referrals at last screening for one-year eligibles by number and year of screening ($n \geq 100$).

Year	Number of Lifetime Screenings 1	2	3	4	5	Grand Mean
1973	1.476					1.476
1974	1.350	1.153				1.344
1975	1.137	1.024				1.120
1976	.995	.885	.824			.961
1977	.994	.904	.890	.787		.923
1978	.933	.869	.859	.800	.923	.895
1979	.794	.743	.695	.695	.646	.747
1980	.691	.612	.538	.557		.603
Grand Meand	1.010	.837	.765	.718	.709	

program's past five years, referrals decreased 37 percent (.961 - .603/.961). These trends are all consistent with Table I data and show referrals have been given with less frequency as the program has aged.

The effect of history in distorting Table II is shown in Table II(S). For each year between 1974 and 1980, the decrease in referrals from screening one to screening two is less than the Table II grand mean change of -17 percent. The average decrease for these years was 9 percent between screenings one and two, again nearly half of the change represented by the Table II grand mean. The average decrease from screening two to three was 5.6 percent (versus 8% shown in Table II) and the decrease between screenings three and four was 3.75 percent (versus 7% in Table II). Over all screenings, the decrease in referral rates with history controlled is 57 percent of the rate obtained in Table II without this control (.09 + .056 + .0375/.17 + .08 + .07).

Again, regardless of the influence of history, Hypothesis 1 is generally confirmed in Table II(R). Each row (year) shows a general downward trend in referrals as program participation increases, although there are several exceptions. In 1978, those receiving a fifth screening had more referrals than those receiving a fourth screening. However, the fifth screening was based on 118 subjects, only a small number above the minimum considered necessary for a valid base. A second exception is between screening three and four in 1979 where there is a leveling effect rather than a continued downward movement. The final exception occurs between screening

Table II(S). Percent change in average number of referrals at last screening as number of lifetime screenings increase by one for one-year eligibles by year of screening ($n \geq 100$).

Year	Changes in Number of Lifetime Screenings 1-2	2-3	3-4	4-5
1974	-15%			
1975	-10%			
1976	-11%	-7%		
1977	-4%	-2%	-12%	
1978	-7%	-1%	-7%	+15%
1979	-6%	-6%	0%	-7%
1980	-11%	-12%	+4%	
Grand Mean*	-17%	-8%	-7%	-10%

*Grand Mean change is taken from Table II.

three and four in 1980. Here, the fourth screening is based on 262 subjects which would seem to be an adequate number. This change does seem to be a deviation from the general trend but the rate at the fourth screening remains lower than the rate at screenings one and two. In summary, an inverse relationship between referral rates and number of screenings is present with year held constant, although it is not at all times a perfect relationship at all points of program participation.

Table III and Table IV Results

Although the Table I and Table II series establish the general validity of Hypothesis I, several additional approaches were used to explore further this relationship. Tables III and IV show referral rates for screenings occurring in 1978 only. By presenting same-year outcomes, history's effect is controlled. Based upon the data shown in Tables I/II(S), the expectation is that Tables III and IV will show Hypothesis 1 holding in a given year but showing less strength than was present in Tables I and II where history confounded results. Accordingly, Tables III and IV are of interest but will be discussed in a more summary fashion than Tables I and II since the latter did confirm Hypothesis I.

To simplify further the following discussion, and in recognitiion of the volume of tables used in this study and the resulting discontinuity should they all be placed within the narrative, Tables III and IV are placed in Appendices C and E respectively. The "Ns" for Tables III and IV are placed in Appendices D and F respectively. Also, since previous review has generally found little difference in outcomes between the long and short-term eligibles, Tables III and IV will be discussed concurrently rather than sequentially.

As expected, Table III and Table IV, giving referral rates for all subjects in the population without demographic breakdown, confirm Hypothesis 1 across all grand means which are based on a sufficient number of subjects, with a single exception. In Table IV, referrals increase 15 percent between screenings foun and five. However, the screening five rate is based upon only 118 subjects, which is the likely source of difference. Also, as shown in Table I/II(S), the rate of decrease is lower than obtained without a control on the year of screening. That is, whereas the decrease between screening one and screening two was 24 percent in Table I and 17 percent in Table II, it is 15 percent and 7 percent for Tables III and IV respectively. Again, this is important information since it says the program's benefits are not as strong as they appear to be without proper analytic control.

Race as a factor [Tables III/IV(A)-(D)] does not disrupt the Hypothesis 1 relationship with the exception of blacks in the Table IV series. Here, referral rates at screenings two-four are very similar, although they are 10-11 percent below the initial rate. Black rates remain highest of the racial/ethnic groups although the black-white difference is somewhat smaller than in the Table I/II series. At initial screening, blacks had 28 percent and 20 percent more referrals than whites in the Tables I and II series respectively; the comparable differences are 23 percent and 17 percent for Tables III and IV respectively. The number of American-Indians was insufficient to place confidence in their results.

Differences by sex [Tables III/IV(E)-(F)] do show a complete reversal from the Table I/II series with females screened in 1978 showing higher referral rates than males. The differences were small, 6 percent and 2 percent in Tables III and IV respectively. However, this is an interesting development given that males have traditionally exhibited somewhat higher rates of medical problems with females only recently narrowing the difference on some indices. Also, rates for females rise in both Table III and Table IV between screenings two and three. The increases were small (2%-3%) but this upturn was not present in Tables I(F) and II(F). In both cases, the rates decrease at screening four.

Analyzing the racial/ethnic results by sex [Tables III/IV(G)-(N)] does not provide much new information. It does show that females of each group have higher referral rates than males at initial screening. Also, it discloses that the increase in female referrals between screenings two and three is primarily attributable to white females although the upswing is also evident for blacks. This series appears to correct the impression that black males show a disproportionately positive response to the program as reflected in unusually high decreases in referrals. From Table I(I), the decrease in their referral rates between initial screening and rescreenings was calculated to be 34 percent. From Table II(I) the comparable decrease was 26 percent. These decreases were the largest shown by either sex in any racial group. However, they do not hold for those screened in 1978. Tables

III/IV(I) and III/IV(J) show changes by black males and females are quite similar. From Tables III(I) and III(J), referrals decrease 18 percent from initial screenings to rescreening for both males and females (1.097 - .895/1.097 for males and 1.186 - .974/1.186 for females). From Tables IV(I) and IV(J), the comparable decreases are 12.5 percent for males (1.103 - .886/1.013) and 10.5 percent for females (1.045 - .935/1.045).

Location differences hold for those screened in 1978. In the Table III series, Detroit residents averaged 61 percent more referrals than outstate participants at initial screening (1.318 - .817/.817), and 51 percent more referrals for all rescreenings (1.129 - .746/.746). In the Table IV series, the comparable differences were 38 percent at initial screening (1.057 - .768/.768) and 40 percent for rescreenings (1.077 - .771/.771). The latter differences were less than those obtained in the comparable Table II series but are still considerable. It is reasonable to expect these data are consistent with the Table I/II series with respect to the generally higher referral rate of blacks not being responsible for these urban-rural differences.

Analysis of Covariance

The use of analysis of covariance to test formally Hypothesis 1 afforded a different and supplementary perspective on the predicted relationship between referral rates and number of lifetime screenings. However, since the population data consistently showed a strong, although not always perfect, inverse relationship between these variables, we would expect analysis of covariance to confirm Hypothesis 1. This confirmation did occur.

As noted previously, when there is interest in analyzing the influence of two independent variables, one of which is nonmetric and the other metric, a useful analysis to employ is the analysis of covariance. Both metric and nonmetric variables were present in this study. The original independent variable of interest, "number of screenings," is a metric variable. That is, numbers have an ordered relationship of equal difference between them. Tables I/II(R) show that this variable does affect referral rates. However, these tables also show that time, or the "year of screening," has a similar, depressing influence on referrals. Accordingly, "screening year" is also an independent variable, but one which is nonmetric. "Year" has no quantifiable meaning other than representing a category. Moreover, Tables I/II(S) show that referral rates vary somewhat by year as a function of number of screenings. Specifically, this is indicated by the differing percentage of reductions in referrals as screening year varies. This means the slope of the inverse relationship between referral rates and number of screenings varies by year of screening, or said differently, screening history does not have the same magnitude of effect on referral rates each year. In short, some interaction is occurring between the twoindependent variables. Because of the types of variables involved, and their interaction, the most appropriate method of analyzing them further is the multiple regression method of analysis of covariance.[2]

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[2]Norman H. Nie, et al., Statistical Package for the Social Sciences, (New York: McGraw-Hill Book Company, 1975), 381.

The nominal variable "screening year" is represented by a set of dummy, interval variables (0,1) which serve to treat each year as a separate category and to assign thereby an arbitrary metric value to each year.

The standard SPSS program provides several multiple regression solutions in the analysis of covariance context in order to test various hypotheses of interest. Hypotheses and their solutions are discussed next for the long-term eligibles.

Logically, the first question to answer in this method of analysis is whether the model which best relates dependent and independent variables is interactive or additive. As discussed, the difference in these models concerns whether the effect of past screenings is constant or variable across the years. Tables I/II(R) showed some variable or interactive influence, however this strength proved insufficient to be reflected in the analysis of covariance.

The obtained, overall F for the interaction model, which tests its statistical significance, was 45.63 with the critical level of $_{95}F_{1,11202} = 3.84$. This means the interaction model was statistically significant at the .05 level and likely depicts a true relationship existing among the dependent and independent variables. In other words, referral rates are inversely related to past screenings, given control of year of screening and interaction between past screening and year of screening. However, the obtained R^2 for this model was only .0503 which means the model explains but 5 percent of the variance in referral rates. This is very low, likely indicating considerable variablility in outcome and meaning that the predictive power of the model is weak, even though the model quite likely depicts a true inverse relationship. The low R^2 also means the following, detailed analyses done of the regressions are somewhat "academic" since they tell much about factors which explain little. The overriding message of the obtained R^2 is that Hypothesis 1 is confirmed but explains little about referral rates.

In determining whether the interaction or additive model was most appropriate for the obtained data, the question is whether the increment in the proportion of variance in referral rates accounted for by the interaction is significant. The comparison is accordingly between the R^2 obtained by the interaction model (.0503) and the R^2 obtained by the additive model (.0497). As can be seen even without statistical analysis, there is virtually no difference in the two R^2s and formal testing confirmed the difference was not statistically significant (calculations and ANCOVA summary are in Appendix G for the long-term eligibles). Consistent with the interactive model's lack of additional explanatory power was the lack of statistical significance for interaction terms in any single year except one. Only interaction for 1974 was statistically significant for the six years studied.

Apparently, the interaction reflected in Tables I/II(R) was simply not sufficiently powerful to be determined statistically significant. Therefore, the additive model was considered most appropriate for representing the data since this is procedurally the correct decision when the interactive model is not determined superior to the additive one. However, the interactive model is presented and discussed briefly in Appendix H. In any event since the prediction of referral rates was not of direct concern in this study, the negligibly different predictive abilities of these models was of little consequence. The additive model is as follows:

$$Y' = A + B_1D_1 + B_2D_2 + B_3D_3 + B_4D_4 + B_5D_5 + B_6D_6 + B_7\text{NumScren}.$$

Where: D_1 = 1 if last screened in 1973, 0 otherwise;
D_2 = 1 if last screened in 1974, 0 otherwise;
D_3 = 1 if last screened in 1975, 0 otherwise;
D_4 = 1 if last screened in 1976, 0 otherwise;
D_5 = 1 if last screened in 1977, 0 otherwise;
D_6 = 1 if last screened in 1978, 0 otherwise;
NumScren = Number of lifetime screenings;

and

Y' = Predicted referral rate,
A = "Constant" or Y intercept for 1979
B_1 = Slope for 1973,
B_2 = Slope for 1974,

B = Slope for 1975
.
.
B_6 = Slope for 1978,
B_7 = Slope for 1979 or Slope for NumScren when D_1-D_6 = 0, i.e. when screening year is controlled.

The model specifies a linear relationship between the independent and dependent variables and, given knowledge of the last year of screening and the number of lifetime screenings, predicts the number of referrals. The predictive accuracy of the model (in comparison to actual outcomes) is given by the Multiple R-correlation. The statistical significance of the Multiple R, and therefore the statistical significance of the entire model is given by the overall F test. Results follow for the long-term eligibles.

Table V. Results of multiple regression method of analysis of covariance for long-term eligibles.

Multiple R	0.2231	F
R Square	0.0497	83.8379
Adjusted R Square	0.0491	
Standard Error	1.0548	

Variables In The Equation

Variable	B	Beta	Std. Error B	F
D_1	0.6596	0.1102	0.0613	115.725
D_2	0.5625	0.1749	0.0396	200.948
D_3	0.3437	0.0978	0.0407	71.261
D_4	0.1604	0.0468	0.0387	17.142
D_5	0.1692	0.0565	0.0337	25.111
D_6	0.1235	0.0478	0.0296	17.372
NumScren	-0.0822	-0.0680	0.0138	35.569
Constant	0.9542			

The obtained F of 83.8379 is the result of the overall F test which estimates whether the sample data have been drawn from a population with a multiple correlation equal to zero, or equivalently, whether the obtained multiple R correlation is actually due to sampling variation. Technically, the null hypothesis being tested is that the multiple correlation is zero. The obtained F is compared with the F value given by statistical tables, at the desired level of significance. If the computed F value is larger than the statistical table's critical value, the null hypothesis is rejected. Otherwise, it is concluded that the obtained (multiple) R is not a statistically significant finding.

For the Table V data, the critical value for ${}_{.95}F_{1,\ 11210} = 3.84$. The obtained overall F exceeds this value so the null hypothesis is rejected. There is reasonable assurance that the R reflects a true relationship.

The multiple R, or "R," is the "coefficient of multiple correlation" and gives a measure of correlation between the dependent and independent variables. The R^2 (the "coefficient of multiple determination," which is simply the square of the R) has a more straightforward meaning and thus is usually used to interpret the findings. R^2 is a measure of the effect of all the independent variables combined on the dependent variables. More specifically, it gives the percent of variance of the dependent variable which is explained by the regression equation. It is a measure of the "goodness of fit" of the regression line to the actual data.

Table V shows that the full model explains 4.98 percent of the variance in referral rates. This is not a "good" explanation, meaning the selected independent variables are poor predictors of referral rates. Clearly, a R^2 of .80 or above would show strong predictive powers. In such a case, knowledge of predictor variables could be used to estimate outcomes with little margin of error and would indicate a strong association between predictor and outcome variables. The obtained R^2 in this study indicates a relationship exists between the variables of interest but the relationship is subject to much variance and apparent influence from other factor(s) as evidenced by the considerable shortfall from perfect association (1.00).

The adjusted R Square is a measure which takes into account the number of independent variables in relation to the number of observations. Its purpose is to facilitate comparisons of the "goodness of fit" of several regression equations that may vary with respect to the number of independent variables and observations.[3] No such comparisons were made in this study. Also, because of the large sample size used in this study, the adjusted and unadjusted R Squares are virtually identical.

The standard error of estimate gives the "average" error in predicting referral rates upon the basis of the variables in the regression equation. Technically, it is the standard deviation of the residuals (Y-Y'). The obtained standard error of 1.0548 means that approximately 68 percent of the actual scores will be within one standard deviation of the predicted score, or Y' ± 1.0548, assuming a normal distribution of actual scores about the regression line. This is a fairly wide margin of error and was foretold by the low R^2.

The B values are the "partial regression coefficients" and indicate the influence of each independent variable on the outcome variable with all other independent variables held constant. A primary contribution of partial regression coefficients is in correcting the overestimation of a variable's effects which can result from using a bivariate analysis where the influence of confounding factors is not controlled. In surveying the obtained Bs, several points are of interest. The basically descending value of the slopes of the screening years (B_1 - B_6 for D_1 - D_6) reflects history's effect in decreasing referral rates over the

[3]Jan Kmenta, Elements of Econometrics, (New York: The Macmillan Company, 1971), 365.

years. Also, the negative sign for Numscren B indicates the existence of the predicted inverse relationship between dependent and independent variables. The constant .9542 is the predicted number of referrals per screening in 1979 given no knowledge of lifetime screenings.

The Betas are the standardized Bs, or "standard partial regression coefficients." They are the Bs converted to comparable terms and indicate the number of standard deviation units change in the dependent variable that would be predicted when the independent variable changes by one standard deviation unit. They are also known as "beta weights." The Betas do not allow for estimating Y values in the original raw value units but they are particularly helpful when the independent variables are measured in different units since they allow a common means of comparing the relative effects of the different variables. Specifically, in Table V the Betas show that the first three years of screening, and particularly 1974, have the largest impact on determining the predicted referral rates per the full model.

The standard error of B gives the standard deviation of B. Thus, 68 percent of the Bs are considered to be included within plus or minus one standard deviation, assuming a normal distribution of Bs. The most common use of this statistic is in construction of confidence intervals for the Bs to thereby estimate the interval within which the true B is likely to be located.

The F for each B is the F test statistic for whether the obtained B value is likely a true one. Again, the null hypothesis is that the population B = zero. If the computed F value is larger than the statistical table's critical value for a given confidence level, the null hypothesis is rejected. Otherwise, it is concluded the observed B is not significant at the chosen confidence level. Whether the calculated Fs are significant is not indicated by the report and must be determined by first identifying from other reports the number of subjects belonging to each study group and then finding the appropriate critical value for the sample in an F table. Fortunately, since the number of subjects is so large in this study, this determination is quite simple. The critical value for ${}_{.95}F_{1, (N-2)}$ is 3.84 where N-2 equals more than 120 subjects. The sample of each screening year is based upon thousands of subjects so 3.84 is the critical value for the F of each B. Each F is thus significant at the .05 confidence level as each exceeds the critical level. It is likely that each B reflects a true relationship between the dependent and independent variable of interest.

Testing was also conducted to determine whether the main effects of screening year and number of lifetime screenings are each significant when the other is controlled. In both situations, the question is whether the increase in the proportion of variance accounted for by the variable of interest is statistically significant when the influence of the other variable is controlled. In both cases it was. The effects of screening year are equal to the R^2 difference between the additive model and the bivariate model for number of screenings. The difference (.0497 - .0270) yields an F of 258.27, significant at any level. The effects of lifetime screenings are equal to the R^2 difference between the additive model and the multiple regression for screening year. The difference (.0497 - .0467) yields an F of 5.935, significant at the

.05 level of significance (calculations are placed in Appendix G).

To demonstrate graphically the Hypothesis 1 relationship by year, the following equations would be used based upon the additive model and the Table V data:

For 1979, NR = A + B_7NumScren;

For 1978, NR = (A + B_6) + B_7NumScren;

For 1977, NR = (A + B_5) + B_7NumScren;

For 1976, NR = (A + B_4) + B_7NumScren;

For 1975, NR = (A + B_3) + B_7NumScren;

For 1974, NR = (A + B_2) + B_7NumScren;

For 1973, NR = (A + B_1) + B_7NumScren;

where: NR = Number of referrals.

By computation, these equations become

For 1979, NR = .9542 - .0822 NumScren;

For 1978, NR = (.9542 + .1235) - .0822 NumScren,

= 1.0777 - .0822 NumScren;

For 1977, NR = (.9542 + .1692) - .0822 NumScren,

= 1.1234 - .0822 NumScren;

For 1976, NR = (.9542 + .1604) - .0822 NumScren,

= 1.1146 - .0822 NumScren;

For 1975, NR = (.9542 + .3437) - .0822 NumScren,

= 1.2979 - .0822 NumScren;

For 1974, NR = (.9542 + .5625) - .0822 NumScren,

= 1.5167 - .0822 NumScren;

For 1973, NR = (.9542 + .6596) - .0822 NumScren,

= 1.6138 - .0822 NumScren.

According to Nie, et al., in using dummy variables all categories of the nominal variable can not be entered in the regression equation since doing so would render the computational formulas unsolvable. This occurs because the last dummy entered would be completely determined by the preceding variables. Therefore, one variable is not entered in the equation but serves as a reference point, or in this case, the "base year." This treatment does not result in a loss of information and the selection of the variable to use in this fashion is arbitrary.[4] In this study, 1979 was used as the base year. Accordingly, each B coefficient for D_1-D_6 is equal to the difference in predicted referral rates between the intercept of the regression equation for its year and the intercept of the base year or constant. Thus, to obtain the intercept for a given year, it is necessary to add the B value and the constant.

The above equations are the best predictors of referral rates by year given knowledge of the independent variables. The graph of each line is presented on the following page. For each year it is apparent that the slope of the prediction line is negative, i.e. the variables are in an inverse relationship as predicted.

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[4] Ibid., p. 374.

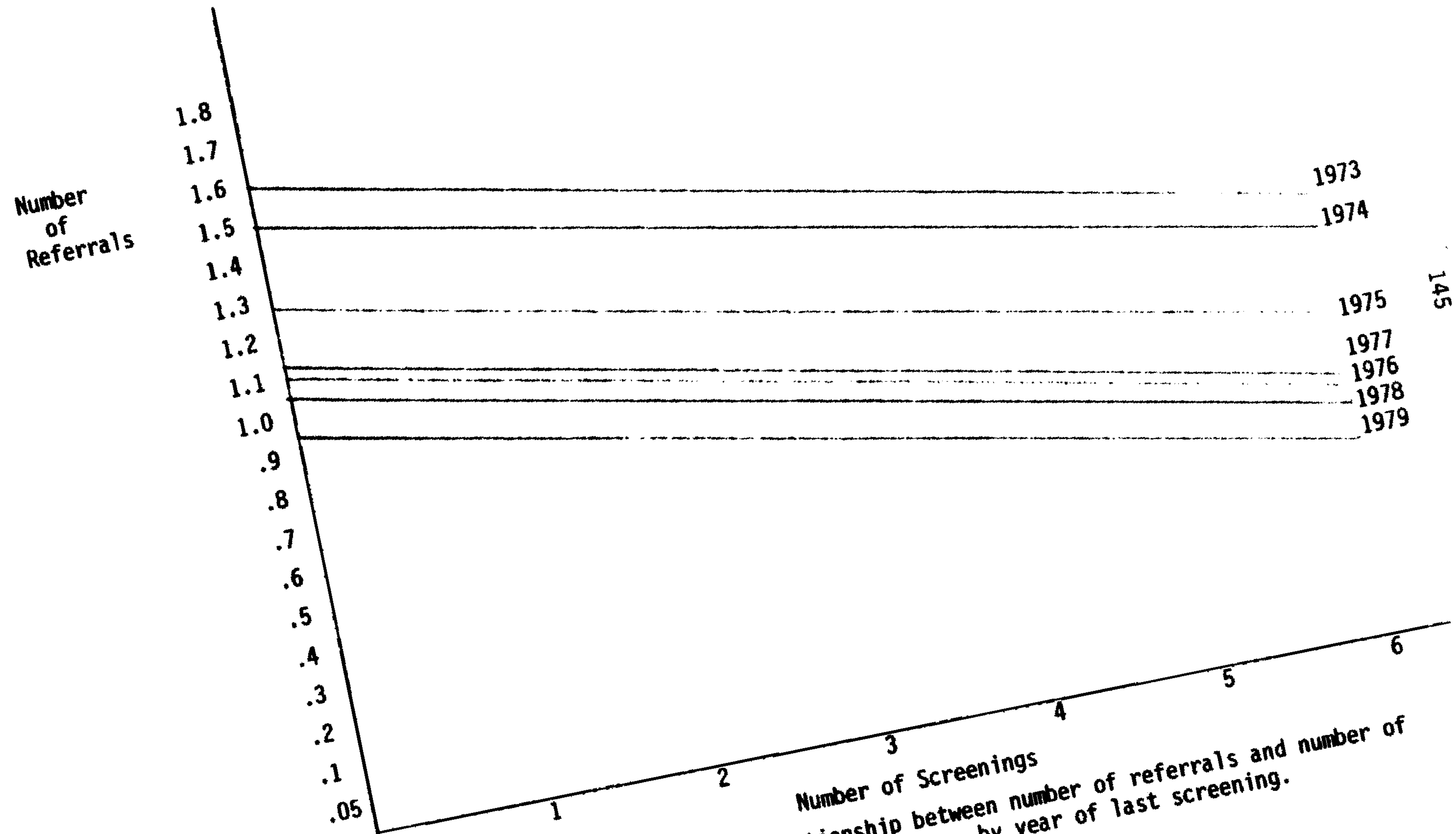

Figure I. Regression lines depicting the relationship between number of referrals and number of lifetime screenings for the long-term eligibles, by year of last screening.

Data for the short-term eligibles are similar to Table V.

Table VI. Results of multiple regression method of analysis of covariance for short-term eligibles.

Multiple R	0.1893	F
R Square	0.0358	54.2989
Adjusted R Square	0.0351	
Standard Error	1.0212	

Variables in the Equation

Variable	B	Beta	Std. Error B	F
D_1	0.7449	0.0902	0.0828	80.913
D_2	0.6107	0.1570	0.0430	201.779
D_3	0.3364	0.0876	0.0420	63.890
D_4	0.1830	0.0544	0.0373	24.055
D_5	0.1523	0.0533	0.0323	22.225
D_6	0.1284	0.0550	0.0271	22.301
NumScren	-0.0521	-0.0407	0.0136	14.665
(Constant)	0.8414			

Again, the F statistic is significant meaning the hypothesis: R = zero is rejected. There is reason to believe the R^2 and regression line do depict a true relationship. The amount of variance explained by the independent variables is even slightly less than that obtained for the long-term eligible group. However, the regression lines are of approximate equal validity for both study groups. Again, referral rates and number of past screenings are inversely related when year of screening is controlled (denoted by the negative B coefficient for NumScren) and the F value for each coefficient exceeds the critical level indicating each obtained B value is statistically significant at the .05 confidence level. When the lines are computed by year, as previously show, the following is obtained (the additive model is again preferable to the interaction model as shown in Appendix I).

For 1979, NR = .8414 - .0521 NumScren,

For 1978, NR = .9698 - .0521 NumScren,

For 1977, NR = .9927 - .0521 NumScren,

For 1976, NR = 1.0244 - .0521 NumScren,

For 1975, NR = 1.1778 - .0521 NumScren,

For 1974, NR = 1.4521 - .0521 NumScren,

For 1973, NR = 1.5863 - .0521 NumScren.

The graphs of these lines are shown on the following page. The most obvious impression is again that of the depressing influence on referral rates of year of screening and number of past screenings. The graph on these lines per the interaction model is presented in Appendix J, recognizing that this model is considered less valid than the additive one.

In summary, the results of multiple regression analysis are basically consistent with the Table I and Table II findings. Referral rates and number of screenings are in an inverse relationship but the regression line which best explains this relationship accounts for only about 3.5 to 5 percent of the outcome.

CPA Results

Categorical Partition Analysis (CPA) was conducted on the long-term and shorter-term eligibles. As discussed previously, CPA tests for

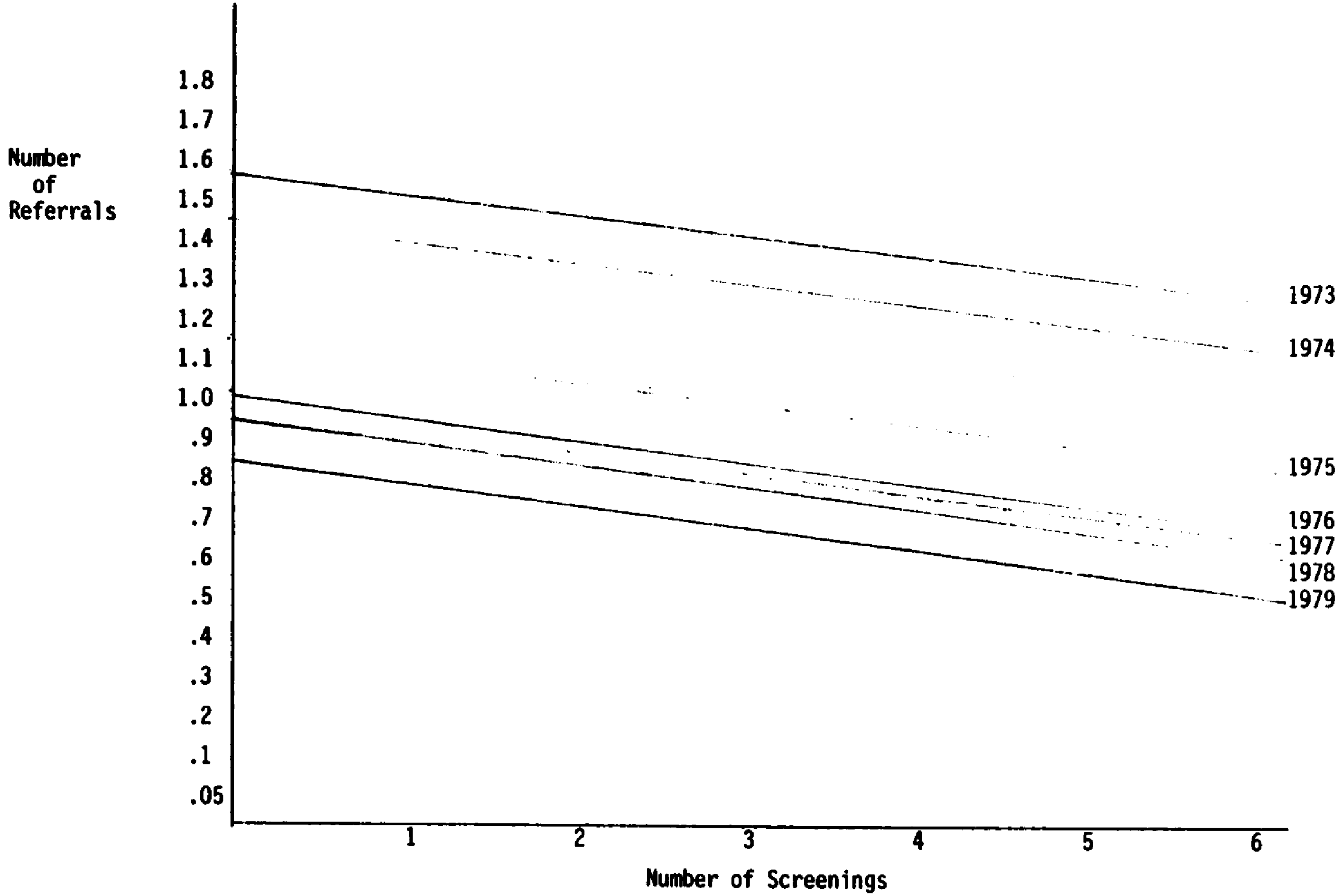

Figure II. Regression lines depicting the relationship between number of referrals and number of lifetime screenings for the one-year eligibles, by year of last screening.

associations between variables and "splits" on any variables which show a statistically significant degree of association. For both groups of eligibles, CPA produced no "splits" on the independent variables, meaning no significant association (at the .03 level of confidence) was found between any of the independent variables, singularly or in combination, and the dependent variables, referral rates.[5]

This total lack of association is likely best reflected in the R squares of .03-.05 obtained by the multiple regression analyses which analyzed the best predictor variables. Obviously, these correlations are considerably short of a perfect (1.00) association, a fact with which the CPA results would seem consistent. Also, review of the population data, by table format, did not indicate that age, sex and race were strong predictors of outcome. While location differences in the population do seem considerable, apparently they were not of sufficient strength, or featured too much variance, to be recognized by this test. Clearly, other results did

[5]The independent variables were: screening year, location, number of screenings, age, sex and race.

not show location to be a much stronger variable than number and year of screenings, which, as noted above, were themselves far from perfect predictors.

Results on Costs
Tests of Hypothesis 2

As discussed, a bivariate regression was used to test Hypothesis 2 which predicted medical costs would be inversely related to the number of lifetime screenings received. Hypothesis 2 was but an extension of Hypothesis 1 to the variable costs without the complication of the intervening variable "year of screening." The effect of this confounding factor was on referral rates only. Testing a different dependent variable, and additionally using only same-year data, meant the statistical analysis of Hypothesis 2 was more straight-forward.

The results showed that for the long-term eligibles, an overall F of 13.246 was obtained which exceeds the critical value of 3.84 for $_{.95}F_{1,\ 15949}$. This means the obtained r, the zero-order correlation between referral rates and number of screenings, is statistically significant. The obtained r was -0.0288, in the predicted direction, but equal to an r^2 of only 0.0008. This r^2 is so low that the independent variable, although statistically significant, provides virtually no explanation of outcome on referral rates. Knowledge of screening history accounts for only 8/100ths of one percent of the variance in costs. In short, it is quite certain a relationship has been determined which yields virtually no information. Thus, the obtained r square means the result is not meaningful, or useful, and accordingly Hypothesis 2 is rejected. The test for the one-year eligibles produces the same result. The obtained r was a -0.0140. However, the computed F was 3.4530 which did not exceed the critical level (again, 3.840). Again, the hypothesis was rejected. For both groups of eligibles, there was insufficient support in this analysis for believing costs are related inversely to program participation.

Student's t-Test

Although bivariate analysis showed virtually no relationship between costs and program participation, it is possible that expectations of an inverse relationship across four-six levels of participation is too demanding a requirement. Also, review of the obtained data suggested a difference in incurred costs did exist between those screened and those not screened. More specifically, those screened showed somewhat lower costs than those not screened. If substantiated, this would itself be a finding of interest. Accordingly, tests of mean difference were conducted for both of the sampled study groups and for the four racial/ethnic groups comprising each sample.

The hypothesis was:	H_0: $u_1 = u_2$ or there is no difference in the population means.
The alternative hypothesis was:	H_1: $u_1 \neq u_2$ or there is "probably," but not necessarily, a difference in population means.
The significance level equals:	.05 or the probability is 5 per 100 or less of obtaining the mean difference actually obtained when, in fact, there is no mean difference in the population.
Decision rule on the use of variance:	If the two-tailed probability for F is greater than the significance level, use the pooled variance estimate.

	If the two-tailed probability for F is less than, or equal to, the significance level, use the separate variance estimate.[6]
Decision rule on hypothesis:	If the two-tailed probability of obtaining the t statistic is greater than .05, H_0 is not rejected.
	If the two-tailed probability of obtaining the t statistic is less than, or equal to, .05, reject H_0 and accept H_1.

Since it would be of interest to determine that medical costs of EPSDT participants were either greater or less than the costs of non EPSDT participants, two-tailed tests were used. In each table below, the EPSDT participants are designated as "Group 1;" the non participants (number of screenings = 0) are designated "Group 2."

In Table VII the two-tailed probability for F is less than .05, so the separate variance estimate is used. The two-tailed probability of obtaining the t statistic is equal to .05, so H_0 is rejected and H_1 accepted. There is reason to believe the obtained lower costs of $26.18 for EPSDT participants is a true difference, i.e., that it exists in the population from which these subjects were sampled.

In Table VIII, per the decision rule on use of variance, the separate variance estimate is used. Per the decision rule on the hypothesis, H_0 is rejected and H_1 accepted. The difference of $46.52 which favors the EPSDT participants is highly significant statistically. The probability is less than one per hundred that this obtained difference is not a true one.

In Table IX, per the decision rules, H_0 is not rejected. There appears to be no true difference in costs for whites in this population.

[6]Norman H. Nie, et al., Statistical Package for the Social Sciences, (New York: McGraw-Hill, 1975), 270.

Table VII. Results of comparison of medical costs for long-term medicaid eligible EPSDT participants and nonparticipants.

					Separate Variance Estimate		
Variable	Number of cases	Mean	Standard Deviation	Standard Error	T Value	Degrees of Freedom	2-Tail Prob.
Medcost							
Group 1	11210	260.0205	746.7460	7.0530			
					-1.96	8576.54	0.050
Group 2	4741	286.2078	780.535	11.3360			

Table VIII. Results of comparison of medical costs for short-term medicaid eligible EPSDT participants and nonparticipants.

					Separate Variance Estimate		
Variable	Number of cases	Mean	Standard Deviation	Standard Error	T Value	Degrees of Freedom	2-Tail Prob.
Medcost							
Group 1	10230	312.0948	1143.1900	11.303			
					-2.70	13996.61	0.007
Group 2	6073	358.6192	1101.350	12.978			

Table IX. Results of comparison of medical costs for long-term eligible white EPSDT Participants and non participants.

					Separate Variance Estimate		
Variable	Number of cases	Mean	Standard Deviation	Standard Error	T Value	Degrees of freedom	2-Tail Prob.
Medcost							
Group 1	5253	258.1780	673.3970	9.291			
					-0.90	3875.70	0.370
Group 2	2196	274.2891	720.3180	15.371			

In Table X, per the decision rules, H_0 is not rejected. The probability is 26.9% that the difference favoring the EPSDT participants is not a true difference. This degree of error is too large to accept.

In Table XI, per the decision rules, H_0 is not rejected. There appears to be no true difference favoring the EPSDT participants, although the t value is quite close to the acceptable level of uncertainty.

In Table XII, per the decision rules, H_0 is rejected and H_1 accepted. This result is highly significant statistically and is also quite meaningful. The probability is very low, 1.7 percent, that the reported, average lower cost for black EPSDT participants is not a true difference. The amount of the average difference, $64.29, is a rather meaningful figure, especially since 103,939 blacks are in this population.

In Table XIII, per the decision rules, H_0 is rejected and H_1 accepted. American-Indian EPSDT participants have <u>higher</u> medical costs. The difference is highly significant statistically and highly meaningful in dollar terms as it approaches $200 per individual. Despite the test finding, one intuitively feels some reservation about the finding's validity given only nine individuals comprise the non-participant group. The number of American-Indians in this population is 281.

In Table XIV, per the decision rules, H_0 is not rejected. Again, the American Indian EPSDT participants are associated with higher costs but the probability of error is over 50 percent for this finding so the finding is not accepted.

Table X. Results of comparison of medicaid costs for short-term medicaid eligible white EPSDT Participants and nonparticipants.

					Separate Variance Estimate		
Variable	Number of cases	Mean	Standard Deviation	Standard Error	T Value	Degrees of freedom	2-Tail Prob.
Medcost							
Group 1	5688	314.9151	1263.200	16.749			
					-1.10	8420.50	0.269
Group 2	3100	339.9086	847.399	15.220			

Table XI. Results of comparison of medical costs for long-term eligible black EPSDT Participants and nonparticipants.

					Pooled Variance Estimate		
Variable	Number of cases	Mean	Standard Deviation	Standard Error	T Value	Degrees of Freedom	2-Tail Prob.
Medcost							
Group 1	5575	263.5031	826.236	11.066			
					-1.72	8028	0.085
Group 2	2455	298.1984	840.824	16.970			

Table XII. Results of comparison of medical costs for short-term medicaid eligible black EPSDT participants and nonparticipants.

					Separate Variance Estimate		
Variable	Number of cases	Mean	Standard Deviation	Standard Error	T Value	Degrees Freedom	2-Tail Prob.
Medcost							
Group 1	4082	313.9926	1010.806	15.821			
					-2.38	5508.36	0.017
Group 2	2826	378.2897	1163.285	21.883			

Table XIII. Results of comparison of medical costs for long-term medicaid eligible American Indian EPSDT Participants and nonparticipants.

Variable	Number of cases	Mean	Standard Deviation	Standard Error	Separate Variance Estimate: T Value	Separate Variance Estimate: Degrees of Freedom	Separate Variance Estimate: 2-Tail Prob.
Medcost							
Group 1	42	255.0812	562.119	86.737			
					2.17	43.27	0.035
Group 2	9	63.9900	44.803	14.934			

Table XIV. Results of comparison of medical costs for short-term medicaid elgible American Indian EPSDT participants and nonparticipants.

					Pooled Variance Estimate		
Variable	Number of cases	Mean	Standard Deviation	Standard Error	T Value	Degrees of Freedom	2-Tail Prob.
Medcost							
Group 1	56	254.7877	384.179	51.338			
					0.66	63	0.511
Group 2	9	167.2422	238.030	79.343			

In Table XV, per the decision rules, H_0 is not rejected. The margin of error is very high on this obtained difference, as reflected in the similar means and standard deviations.

In Table XVI, per the decision rules, H_0 is not rejected. The nearly identical mean costs are reflected in a t value which almost guarantees error if the mean difference is considered a true one. Medical costs for the Spanish-speaking appear to bear no relation to EPSDT program.

In assessing the t-test outcomes, several comments are relevant, particularly concerning the results for American Indians and the meaning of cost outcomes in general.

Intuitively, one might suspect that the very different outcomes for American Indians are the result of the small number of nonparticipants sampled. However, a different explanation is possible which is consistent with the obtained findings. Costs can be ambiguous in meaning as an EPSDT outcome measure. Clearly, low costs are considered desirable from a cost-control perspective. If a program is determined responsible for reducing costs, this is viewed favorably in most quarters. However, EPSDT was not only intended to reduce costs, but also to increase access to medical services. Certainly, the latter result can increase costs, at least in the short-run. Given that American Indians are perhaps the most excluded racial minority in the United States, it may be that EPSDT serves to increase access, as intended, for this group. Thus, higher costs of participants could be interpreted as reflecting receipt of needed medical treatment and as therefore desirable. Conversely, the lower costs of nonparticipants may mean care

Table XV. Results of comparison of medical costs for long-term medicaid eligible Spanish-speaking EPSDT participants and nonparticipants.

					Pooled Variance Estimate		
Variables	Number of cases	Mean	Standard Deviation	Standard Error	T Value	Degrees of Freedom	2-Tail Prob.
Medcost							
Group 1	307	233.3746	395.983	22.600			
					-0.14	362	0.888
Group 2	57	241.2861	337.626	44.720			

Table XVI. Results of comparison of medical costs for short-term medicaid eligible Spanish-speaking EPSDT Participants and nonparticipants.

					Separate Variance Estimate		
Variables	Number of cases	Mean	Standard Deviation	Standard Error	T Value	Degrees of Freedom	2-Tail Prob.
Medcost							
Group 1	350	264.9599	555.302	29.682			
					0.04	186.71	0.967
Group 2	83	262.9433	359.953	39.510			

is not being received, even if needed, and may not be an indicator of health status.

In general, it is conceivable that low costs for EPSDT participants may be indicative of good health - with EPSDT the explanatory variable - while low costs for nonparticipants may simply indicate lack of participation in the health care system, regardless of need. At this time, the meaning of EPSDT cost differences is subject to interpretation. Since there was some expression when initiating EPSDT that the program would result in reduced medical costs, this study has been interested in determining whether this is occurring. However, any differences are of interest, whether of increased, or decreased costs and it is recognized that obtained differences are subject to interpretation of meaning. Results of the t-Tests do show some evidence of EPSDT participants incurring lower medical costs, although program costs must also be considered as is discussed in Chapter V.

Results on Costs
Tests of Hypothesis 3

A bivariate regression was also used to test Hypothesis 3 which was basically an extension of Hypothesis 2 to the matter of short-term costs. The basic question was the same as with Hypothesis 2, do costs vary inversely with program participation, but vary in the short-run? The findings were consistent with those of Hypothesis 2.

For the long-term eligibles, the computed F was 16.392 which exceeded the critical value of 3.84 for ${}_{.95}F_{1,\ 15949}$. Since the critical value was exceeded, we reject the null hypothesis that r = zero. The r of 0.032 is statistically significant but the r^2 was only 0.001, thereby explaining a miniscule amount of variation. The finding is not meaningful and consequently Hypothesis 3 is not confirmed. Interestingly, the obtained slope of the regression line is in the opposite direction from that predicted (i.e., the sign of the r is positive, indicating costs increase with EPSDT participation). For the short-term eligibles, the result was the same. The computed F was 5.049 which exceeded the critical level of 3.84. The obtained r of 0.0176 is equal to an r^2 of 0.00031. Again, the result was statistically significant, but not meaningful and in the opposite direction from that predicted. Accordingly, Hypothesis 3 was not confirmed for the short-term eligibles. For both groups of eligibles, short-term costs were not shown to bear a meaningful relation to EPSDT participation.

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of this study was to evaluate selected outcomes attributable to the Early and Periodic Screening, Diagnosis and Treatment (EPSDT) program in order to better determine whether EPSDT is benefitting its participants in Michigan. Evaluation was done on two outcome variables: (1) referral rates (number of referrals/number of individuals screened) and (2) Medicaid costs. The main interest was in whether outcomes varied by degree of program participation, namely the number of lifetime screenings, with attention given also to the influence of demographic variables. Review was conducted of the program's history, purpose and related literature and several suggestions were made for future study.

Summary of the EPSDT Program

EPSDT is a Great Society program, legislated in the late 1960s and surviving to the present. The ultimate reason(s) for initiating the program was likely the same reason all Great Society programs were initiated, namely political ones. The stated reasons were concerns that the poor had a higher incidence of health problems than upper income groups with less access to medical resources. It was believed that many of these problems could be corrected, or improved, if detected and treated an an earlier state. EPSDT was to address these needs by first dividing the eligible population into two groups on the basis of screening tests' results. Those failing the tests are considered most in need of medical resources and accordingly are referred for diagnosis and/or treatment services and assisted, where necessary, with gaining entry to these services. Those passing the tests are encouraged to be rescreened at a later time. Outreach of eligibles to encourage participation is an important part of the program. It is of course expected that these procedures will benefit participants by improving their health status.

Despite the fact that Great Society programs, including EPSDT, had Congressional support and were legislated quickly, EPSDT was implemented slowly. Enacted into law in early 1968, it was not until 1973-74 that most states had programs. Often state programs were initiated only as a result of legal action. Michigan's program began in 1973 and, as is the case with most states, has continued functioning at a stable level since that time.

Summary of Screening Program Outcomes

The literature on screening outcomes can be divided into two sections: (1) studies of nonEPSDT programs and (2) studies of EPSDT. The nonEPSDT literature consists mainly of mortality rate studies and studies conducted by Health Maintenance Organizations (HMOs).

There is a consistent trend in the mortality literature which shows screening participants have lower mortality rates than those not screened. These studies span a half century, from the 1920s to the 1970s. However, researchers were generally aware of methodological limitations in these studies and were cautious in interpreting findings. The lack of random selection of subjects was near universal, as is usually the case in all screening programs, while it was generally not clear whether an explicit linkage had been established between screening and receipt of needed treatment services. Clearly, screening by itself can not be credited with improved outcomes. It is also the case that mortality rates, while important, are totally insensitive to any change less dramatic than life or death.

The HMO studies show mixed results. Findings were present which favor the screening participants, but these were not consistent across age and sex. Reasons for the variations were not known. However, there was considerable mixing of the study and control groups with a sizable number of controls actually receiving "treatments." Thus, dilution of the treatment effect may not be unexpected.

The four EPSDT studies reviewed showed consistent results favoring EPSDT participants. The Community Health Foundation, in a North Dakota study, found that the total medical costs of EPSDT participants were lower during the screening year than were the costs of the EPSDT nonparticipants.[1] Similarly, Applied Management Sciences, in a comparison of a northern industrial and a southern rural state, found EPSDT participants incurred lower costs than nonparticipants in the years before, during and after screening.[2] In both studies, EPSDT was associated

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[1]Community Health Foundation, "Cost Impact Study of The North Dakota EPSDT Program," (Evanston, Illinois: Community Health Foundation, 1977). (Mimeogrpahed.)

[2]Applied Management Sciences, <u>Assessment of EPSDT Practices and Costs - Report on the Cost Impact of the EPSDT Program</u> (Silver Spring, Maryland: Applied Management Sciences, 1976).

with increased recipient costs although EPSDT participants, in spite of the increase, continued to have lower costs than those not participating in the program. Currier's Michigan study found that 21 percent fewer participants were referred from rescreening than were referred from an initial screening.[3] This result is in the same direction as the Philadelphia Health Management Corporation finding that a rescreened group had a 30 percent lower referral rate either compared with itself over time or compared with a control group receiving an initial screening only.[4] These EPSDT studies, being current and program specific, gave the best bases upon which to devise a rather large scale evaluation of the Michigan program.

Summary of Research Design and Methodology

A computer based study was designed which formally tested three hypotheses. These hypotheses were:

(1). Screenings and referrals are inversely related in number, i.e. the average number of referrals one incurs is inversely related to the total number of lifetime screenings one has received.

(2). Medicaid costs are inversely related to the total number of lifetime screenings one has received, i.e. cost decline as lifetime screenings increase.

(3). Short-run Medicaid costs increase following screening, are

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[3]Richard Currier, "Is Early and Periodic Screening Diagnosis and Treatment (EPSDT) Worthwhile?," Public Health Reports, XCII (November-December, 1977), 527-36.

[4]Philadelphia Health Management Corporation, A Study of the Process, Effectiveness, and Costs of the EPSDT Program in Southeastern Pennsylvania, Part III, (Philadelphia, Pennsylvania), 1980.

greater (following screening) for screened than for unscreened individuals and are inversely related to the total number of lifetime screenings one has received.

Regression analysis was used to test all three hypotheses and Hypothesis 1 was also analyzed through observation of population data, including observation of demographic effects. In addition, Categorical Partition Analysis (CPA) was done of referral rate outcomes by selected demographic variables and Hypothesis 2 was modified to test whether the mean costs of all EPSDT participants were different from the mean costs of EPSDT nonparticipants.

The study's overall design was one of making observations, specifically determinations of referral rates and costs, and analyzing these data in relation to a history of screening participation, i.e. "treatment" effects, and selected demographic factors.

Actual subject selection, outcome calculations and tests were conducted by computer. Two populations of EPSDT eligibles were determined. One population consisted of individuals eligible continuously for EPSDT between January 1, 1974 and December 31, 1979. This population numbered 79,754. The other population was of individuals eligible for at least all of 1979, and numbered 244,551. It was believed that both groups merited inclusion in the study and a subsequent consideration was whether their outcomes varied.

For each population, the computerized EPSDT history file of 535,753 screenings was first searched for records. For subjects with a screening history, screenings were ordered by date of screening with calculations made of referral rates at the last, i.e. most recent screening. These referral rates, grouped by number of lifetime screenings, were used to test Hypothesis 1 through direct observation of outcomes.

Also, a systematic, random sample was taken from each of the two population groups. The sample of continuously eligible recipients totaled 15,951 (20% of the population) while the sample of 1979 eligibles totaled 16,303 (6.67% of the population). Analysis of covariance and Categorical Partition Analysis were conducted on those screened in both samples to determine the relationship, if any, between referral rates and various independent variables. Medical cost data were obtained for both groups (including those subjects never screened) and were analyzed by the bivariate method of regression analysis to test Hypothesis 2 and 3 as well as by Student's t-test for mean differences in costs between all EPSDT participants and non-participants.

In determining referral rates, immunization referrals were not considered since reporting was not consistent for this item. Also, members of Health Maintenance Organizations (HMOs) were not included in the study since their medical costs are not placed on computer file.

The number of subjects studied in this research is noteworthy. To test Hypothesis 1, by direct observation, referral rates were analyzed for a combined population of 210,233 subjects. This is by far the largest group upon which an EPSDT outcome evaluation has been conducted. Similarly, the combined sample for the two study groups used in the cost analysis totaled 32,254 subjects, again the largest sample used in studying the program. The weight of these numbers contributes to the credibility of the findings.

Summary of Results

The most important findings of the study are as follows:

(1). Hypothesis 1 was confirmed by two different testing strategies. Direct observation of population data showed that referral rates were inversely related to the number of lifetime screenings received. When test groups consisted of 100 or more subjects each, group referral rates generally decreased across the first four-five screenings.

More specifically, direct observation of the population data showed, with history controlled, that the referral rate for those receiving a second screening was approximately 10 percent less than the rate received by those initially screened [12% for the long-term eligibles, per Table I (S) and 9 % for the short-term eligibles, per Table II(S)]. Similarly, the rate decreased in moving from the second to third screening (a 12% average decrease in Table I(S) and a 5.6% decrease per Table II(S) and decreased again from the third to fourth screening [6.25% in Table I(S) and 3.75% in Table II(S)]. In short, the inverse relationship was consistently present but showed some dilution of strength as rescreenings increased.

Hypothesis 1 was also confirmed by the multiple regression method of analysis of covariance. When year of screening was treated as variable, in addition to the number of screenings received, the regression line formed to test Hypothesis 1 accounted for 4.97 percent of the variance in referral rates for the long-term eligibles and 3.58 percent for the short-term eligibles. Both results were statistically significant at the .05 confidence level. In generalizing, it could be said that the regression lines accounted very little of the variance in outcome.

The results of both testing strategies are consistent across both subject groups as well as consistent with each other. The results were also in the same direction, although of a lesser magnitude of effect, as other cited EPSDT studies. The "meaningfulness" of the findings is open to differences of view. The 10 percent, and less, reductions in referrals, were strong in consistency but "modest" in effect, assuming one considers "treatments" with 10 percent reductive power to be modest. Similarly, the regression lines, in explaining 3.5 to 5 percent of refferral rate variance, seem to indicate that (re)screenings have some, albeit very limited, power to reduce the incidence of referrable problems. The difference between .05 and perfect (1.00) explanation is considerable, indicating variance in outcomes and the effects of other variable(s) in determining referral rates. Number of screenings appears limited in power to predict referral rates although, over large numbers of subjects, its consistent association with reduced referrals is shown.

(2). Hypothesis 2 was not confirmed for either subject group. The obtained result did not support the notion that medical costs are inversely related to EPSDT screenings. This hypothesized relationship was found to be statistically significant for the long-term eligible group but explained only .0008 of the variance in costs. It was therefore concluded that this "explanation" of relationship provided no meaningful information and the hypothesis was rejected accordingly. The hypothesis was not statistically significant for the short-term eligible group.

(3). Tests of the mean cost differences between EPSDT participants and EPSDT nonparticipants produced the following results:

(A). The mean cost of all long-term eligible participants was found to be $26.18 less than the mean costs of long-term eligible nonparticipants. This result was statistically significant at the .05 level of confidence.

(B). The mean cost of all short-term eligible participants was found to be $46.52 less than the mean costs of short-term eligible nonparticipants. This result was statistically significant at the .007 level of confidence.

(C). The mean cost of short-term eligible black participants was $64.29 less than the mean cost of black, nonparticipants eligible for the same time period. This result was statistically significant at the .017 confidence level. For the long-term eligibles, black participants showed mean costs of $34.69 less than the comparable costs of black nonparticipants. This result was statistically significant at the .085 level of confidence.

(D). The mean cost of long-term eligible American Indian participants was $191.09 greater than the mean cost of American Indian nonparticipants eligible for the same time period. This result was statistically significant at the .035 level of confidence. However, this result did not hold for the short-term eligible American Indians where the EPSDT participants had lower costs although at a confidence level far exceeding the .05 level. Since for both eligible groups only nine subjects comprised the group of nonEPSDT participants, confidence was not placed in these findings, despite the statistical significance of obtained results.

(E). Mean cost differences between EPSDT participants and nonparticipants were not found to exist at a statistically significant level for whites or the Spanish-speaking.

There are several considerations in assessing the meaning of the obtained mean differences. For one, screening itself involves a financial cost. During 1979, the year for which the above cost differences were obtained, the determined average cost of an EPSDT screening in Michigan was $65.56.[5] This cost of course must be considered in estimating any cost savings which might be attributed to program participation. Since the rescreening cycle is basically every other year in Michigan, the annual screening cost is reduced by 50% when adding this cost to the participants' yearly medical expenses. The annual screening cost is thereby determined to be $32.78. This adjustment yields the following for 1979 data:

(A). For the long-term eligibles, there are no savings associated with EPSDT participation, given consideration of screening costs ($26.18 - $32.78 = -$6.60). In fact, as shown, medical costs of EPSDT participants are greater than costs for nonparticipants. Since 56,046 of the long-term eligible population had been screened, increased costs associated with EPSDT participation equal $369,903.60 for this group ($6.60 x 56,046).

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[5]This figure is obtained by dividing determined program expenses of nearly $6.9 million by the total number of individuals screened, 105,239. Data are obtained from the Michigan program statistics.

(B). For the short-term eligibles, the financial savings associated with EPSDT participation were \$13.74 per person (\$46.52 - \$32.78). Since there are 154,187 individuals in this population who have been screened, group savings equal \$2,118,529.38 (\$13.74 x 154,187).

Since the long-term and short-term eligible populations are mutually exclusive groups, the costs of the former and savings of the latter could be aggregated yielding a total cost savings of \$1,748,625.78 (\$2,118,529.38 - \$369,903.60).

It is noted that these savings are based upon the <u>determined</u> costs of conducting the EPSDT program. These costs include all clinical costs of screening and outreach costs for Wayne County and approximately ten additional outreach workers in the outstate area. The determined costs do not include outreach costs for most counties in the state, any outstate transportation costs, or related administrative expenses. These latter cost figures are not available, but, as shown, would need to total approximately \$1.75 million to cancel the savings ascribed to the short and long-term eligible groups.

In fact, it is likely program costs do exceed savings. Based upon personal knowledge, an estimate of 75 outreach workers in the outstate area at \$15,000 per worker would not be excessive. These total costs would equal approximately \$1.125 million. The Medicaid transportation budget includes funds for EPSDT transportation and for medically related transportation for recipients of other Department of Social Services programs. This budget equaled approximately \$2 million for 1979. Assuming EPSDT transportation accounts for 50% of this expenditure, another $1 million in costs is added to the program. This additional cost, and related administrative expenses, would erase any program savings and, in fact, would render an overall cost of of perhaps $.375-$1 million associated with the program [$1.75 million savings - ($1.125 million outreach costs + $1 million transportation costs + administrative costs)]. There is admittedly some estimation involved in arriving at this figure. However, assessments of program costs seldom consider all costs involved, which are real costs despite difficulties in determination, and the overall impression in incorporating these costs is that they likely at least balance obtained savings attributable to the program.

(4). Location differences in referral rates were found to exist between Detroit and rural, outstate residents. For the long-term eligibles, Detroiters average 74 percent more referrals than the outstate residents when all screenings are considered (1.352 versus .768). For the short-term eligibles, the Detroit referral rate is 64 percent higher than the outstate rate (1.202 versus .732). These differences are not due to the different racial compositions of the two geographic areas. For the short-term eligibles, Detroit whites average 44 percent more referrals over all screenings than rural whites and Detroit blacks average 83 percent more referrals over all screenings than the rural blacks. Location is strongly influencing referrals although race also appears to be a factor as evidenced by the above figures where the black, urban-rural difference is nearly twice the white, urban-rural comparison (83% versus 44%).

Two explanations seem most plausible for explaining the location differences. For one, rural residents may be more healthy than urban residents. This study has accepted referral rates as reflections of health status and has assumed that referral standards are applied equally throughout the state. All Michigan EPSDT clinics use the same battery of tests, with the same written instructions and referral criteria. Consistent with this perspective, it would be concluded that the urban-rural differences are reflections of differing health status.

However, a second explanation should be considered. It is likely that treatment providers are more available in the urban area, and because of this, it is possible that more referrals are made in that setting. A clinic does not wish to identify a referrable condition for which they can not locate a needed provider. This is frustrating for the clinic and the family in need of service. Thus, it is possible that the supply of providers wields an influence upon referrals. At least in those situations where referral need is marginal, provider supply may influence whether a referral is made.

Provider availability may also explain the urban-rural difference in black referral rates. The referral rate for rural blacks is about half that of Detroit blacks. If providers are generally in shorter supply in rural areas, it may be they are particularly limited for blacks. Conversely, more services in urban areas, such as more developed public health departments, more special projects and clinics, etc., may facilitate black referrals in the city. It is not reasonable to believe the obtained urban-rural difference in black referrals is an accurate reflection of differing health status.

(5). Outcomes for blacks varied from those of whites. Blacks had higher referral rates than whites, indicative of more problematic health status. This finding is consistent in direction with literature showing blacks to have higher mortality rates than whites. Over all screenings, blacks averaged 20 to 23 percent more referrals than whites (20 percent more for shorter-term eligibles per the Table I series and 23 percent more for the long-term eligibles per the Table I series). In comparing costs, white, EPSDT participants and nonparticipants did not show significant differences. However, black participants showed lower costs than nonparticipants at levels of statistical significance in which some confidence can be placed. As discussed above, for the short-term eligible black participants, the difference was $64.29 per individual; for the long-term eligible participants the difference was $34.69 per individual. These differences were statistically significant at the .017 and .085 levels respectively. White participants did show lower costs than white nonparticipants but at levels of statistical significance in which little confidence can be placed (27-37 percent chance of error).

The implication of these findings is that blacks have relatively more need to participate in the program than other racial groups, as evidenced by their higher referral rates and, once participating, incur lower costs than other blacks who do not participate.

(6). Referral rates have declined by year as the program has matured. This statement holds consistently when all referrals are considered and holds generally when the number of previous screenings is held constant. The decline has been large. For both the long-term and short-term eligibles, the referral rate decreased 59 percent in the seven year period 1973-80. This is a reduction of over 8 percent per year. It is not reasonable to believe health status has improved at that rate.

Again, as provider supply may dictate urban-rural differences in referral rates, screening clinics may have accommodated over time to the availability of treatment providers and/or may have refined referral criteria which, in itself, may reflect the influence of the treatment provider. Screening clinics tend to develop a pool of providers who are agreeable to accepting their referrals. In fact, clinics are dependent on these providers if needed treatment services are to be obtained and the program is to function as intended. In this situation, clinics are undoubtedly amenable to the providers' suggestions regarding appropriateness of referrals. If these providers inform clinics that certain levels of problems do not need their attention, clinics will undoubtedly heed their counsel.

That non-medical reasons do influence referral rates is indicated by a recent article which discussed the applicability to Michigan of national standards in growth rates. In Michigan, 25 percent of those screened under age two are below the national standard and, according to those standards, should be referred. However, the authors concluded that "economics and limited resources force us to assess the wisdom of referring 25% of those under age 2 to the medical care system, based on only one screening test."[6] They suggested it may be necessary to base

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[6]Homer A. Sprague, et al., "Comparison of EPSDT and NCHS Growth Charts," Preventive Medicine, IX(1980), 406.

the growth chart referral criteria on a volume of referrals which is "economically acceptable." The point is that determination of medical need is not based solely on the patient's condition but also includes consideration of medical resources.

(7). Few meaningful differences in outcomes were found between long-term and short-term eligibles. It had been anticipated that long-term eligibles would most likely be the ones to show maximum program benefits but this did not prove to be the case. In general, this division of the eligible population did not produce new or different information and appears to have been an unnecessary distinction. An exception to the similarity of findings was the difference between long and short-term eligible costs for EPSDT participants and nonparticipants. However, it does not seem sufficiently useful, or necessary, for any future study to continue this dichotomy of eligibles.

Validity of Referral Rates as Indicators of Health Status

Given the prominent use of referral rates in this study, some comment is needed on their performance as valid indicators of health status: Since all Michigan screenings are conducted by local public health departments, or their designees, operating with identical referral criteria, instructions and training, there is basis for assuming that referrable conditions are determined and processed uniformly throughout the state as well as across differing sexes and racial groups. Also, the purpose of EPSDT, to which all screening teams are professionally committed, is to find problems and assist families in obtaining needed help. Referral rates are, by definition, direct measures of suspected health problems "found" during screening. To believe referral rates are invalid, or even imperfect, indicators of health status is to question the basic integrity of the program. While this study does not show referral rates to be invalid indicators, and indeed they seem to be generally legitimate measures of health, the study does present findings seemingly indicating that referral rates are influenced by non health factors. For example, referral rates decreased over time, even when program participation was held constant. Also, referral rates showed some urban-rural differences which seemed too large to be attributed to only conditions of health, and similarly showed rural blacks to be surprisingly healthier than either rural whites or urban blacks. In short, referral rates seem to be imperfect but generally valid and useful measures of health. The study does not provide a basis for much more precise assessment of this indicator's validity but it does not support an alternative explanation of findings, namely that observed racial group health differences are actually differences of compliance with norms of personal health care.

More specifically, the compliance argument is that some groups are more compliant and conscientious than others about keeping referral appointments and thereby obtaining needed medical care. Therefore, when they return for rescreenings, the incidence of their problems is decreased, as reflected in reduced referral rates. Groups not so compliant will return for rescreening with the original problems uncorrected, thereby increasing their subsequent referral rates. Their problems are simply recounted as rescreenings occur. Thus, the argument is that the measurement of health status through referral rates is actually a measure of compliance with seeking recommended medical attention.

There are several problems with the compliance argument. For one, it is not internally consistent as it assumes those not given to attending to recommended referral needs will be conscientious about returning for rescreenings. It seems more likely that lack of attention to one's own medical needs would be consistent in both situations, meaning those least compliant, and thus least healthy, would drop out of the rescreening process. Secondly, the data are not consistent with the compliance thesis. When reporting referrals, clinic staff do not make a distinction between initial and repeat referrals for the same problem(s). It is not believed that the incidence of the latter is large, but direct analysis of initial referrals only was not possible in this study. However, the thesis would seemingly argue that the most compliant groups, the groups with the lowest referral rates (best health), would show the largest decrease in referrals between the initial screening and rescreenings. The large decrease would indicate compliance with attending to recommended referrals which would then be reflected in lower referral rates at subsequent screenings. However, the data do not show this pattern.

For the long-term eligibles, the referral rate over all screenings was as follows: .817, Spanish-Speaking; .898, whites; and 1.107, blacks (see page 79). Consistent with the compliance thesis, we would expect these groups to be indentically ordered in regard to decreases in referrals from the initial screening to rescreenings. The actual arrangement was as follows: Spanish-Speaking, -32 percent (1.054 at initial screening; .720 at rescreenings); blacks, -31 percent (1.330 - .920) and whites, -25 percent (1.039 - .778). The position of the Spanish-Speaking is consistent with the compliance thesis but the position of blacks and whites is reversed from that which the thesis would predict. In terms of referral decreases, whites appear the least compliant group, which is not what the compliance thesis would predict.

For the short-term eligibles, the overall referral rates were: Spanish-Speaking, .815; American Indians, .821; whites, .850 and blacks, 1.022 (see page 104). Again, the compliance thesis would expect an identical ordering in terms of referral decreases. Actual decreases in referrals from the initial screening to rescreenings were ordered as follows: blacks, -23.5 percent (1.146 - .876); Spanish-Speaking, -20 percent (.923 - .736); American Indians, -19 percent (.898 - .729) and whites, -16 percent (.918 - .769). Here, blacks are at the top of the ranking whereas the compliance thesis would place them last. Blacks show the biggest decrease in referrals between initial and rescreenings which the compliance thesis would say indicates the most compliance with societal expectations of appropriate behavior. However, the compliance thesis would also seemingly predict blacks to be least compliant, or at least less compliant than whites. Also, the black combination of largest referral decreases and largest referral rates is not internally consistent with the compliance argument since it means blacks are the most compliant and least healthy group.

In summary, the compliance thesis finds no support in the data for explaining black-white differences. A method of operationalizing the compliance thesis-use of referral decreases-shows whites to be less compliant, but more healthy, than blacks, an outcome exactly opposite the compliance thesis prediction. The thesis is obviously flawed, if not invalidated, given its apparent inability to account for the outcomes of by far the largest racial groups.

It is acknowledged that, excluding blacks, the compliance thesis does show a consistent and predicted ordering between referral rates and referral rate decreases for the other groups. For example, it is consistent with interpreting Spanish-Speaking and white outcomes. However, little credence should be placed in regarding the Spanish-Speaking as the most healthy group by virtue of their lower referral rates over all screenings. For one, these differences with the white rates are not large. For the long-term eligibles, the Spanish-Speaking showed 9 percent less referrals than whites (.817 vs .898) while the difference was but 4 percent for the short-term eligibles (.815 vs .850). Secondly, these differences, which emerge when using overall referral rates, are likely simply due to a larger percentage of rescreenings being represented in the Spanish-Speaking group than in the white group. From Tables I(Aa) and I(Da), it can be calculated that 71 percent of all Spanish-Speaking screenings were rescreenings as compared with 54 percent for whites. Since fewer problems are found at rescreenings, the overall Spanish-Speaking rate is lower than the white rate. With blacks [Table I(Ba)], 54 percent of all screenings were also rescreenings so black-white differences can not be explained as artifacts of the numbers involved. Black-white comparisons in general appear justified in this study since both involve such large, and similar, numbers of subjects. However, since the numbers of Spanish-Speaking and American Indians are so much smaller than blacks and whites, little confidence is placed in comparing outcomes for these minorities with either whites or blacks.

Implications of Study for EPSDT and Social Work

It is not anticipated that this study will have far-reaching effects on social work or social programming in general. Its focus was not sufficiently broad and its results were not that dramatic, being neither extremely supportive or detrimental to the program. The impact on EPSDT should be more substantial. However, any study, occurring as it does within a specific social and historical context, will have a particular meaning given the concerns of its day. Thus, it may be useful to interpret this study's findings and potential implications relative to the context of 1981.

As noted, EPSDT is a creation of the liberal, welfare state of the 1960s. Governmental concern then was to improve social and educational services to the lower classes, likely for the purpose of strengthening the allegiance of the poor to the larger society or, more specifically, to the Democratic party. The program was initiated and advocated from the top down-by HEW, an arm of the federal government's welfare state bureaucracy. It was not specifically demanded from the state or "grass-roots" level, although the 1960s rebellion of the blacks was governmentally interpreted as a demand for shifting more of society's benefits in their direction.

In 1981, and for the foreseeable future, the concerns of the federal government, and likely the society at large also, are quite different. A major goal of the 1981 federal government is to decrease the costs of public, social programs. The overriding concern is governmental, short-term expenditures and their reduction. Receipt of public services is now viewed negatively since it reflects public costs. The Republican government's constituency in 1981 is different from that of the Democratic government in the mid 1960s. To consolidate national, political power in 1981 means some dismantling of the social welfare state which more liberal governments erected previously to build their own power. Within this context, what then is the meaning of this study?

First, as noted, the major conclusion was not startling or extreme-modest gains for modest costs. This would not seem to be a controversial finding. There is basis in the study for differing conclusions regarding the program's worth. Some aspects of the study are supportive of the program; others are not so positive. These pros and cons would seem to have a potential for balancing one another. However, in the context of 1981 and to the current national government (perhaps state governments as well), the "negatives" will likely overshadow the supportive findings.

Specifically, the finding that the program appears to incur a true cost, over and above savings attributable to the program, has negative implications for the program. This finding is potentially balanced by the finding that participants appear to be benefitting from the program. However, it is likely that recipient benefits will not at all be viewed as counter balancing increased costs. If a program costs in 1981, this is an important and destructive consideration in judging its worth. This finding is particularly important in relation to EPSDT's emphasis on prevention and outreach. The unique, outreach characteristic of EPSDT is now an inherent liability for the program. At a time when the focus is on reducing program costs, a program which actively encourages the use of Medicaid services will not be viewed favorably.

Even the finding that referral rates are higher for blacks than for whites, after continued program participation, can be interpreted negatively. The implication, in 1981, could be that the program is failing to eliminate racial differences in health status. Social programs which "fail" are subject to increased scrutiny, funding reductions, perhaps even elimination.

In short, social program advocates are initially in a defensive position in 1981. Any studies which do not yield strong justification for a program-and justification closely tied to considerations of cost-call the program's worth into question. This discussion is not intended to imply that EPSDT, especially as depicted by this study, is a failure. From the perspective of program advocates, the program is making gains, at modest costs, and may even show greater gains over a longer time period. The point is simply that, judged by the governing powers of 1981, the rather modest program support shown by this study may well be a liability rather than a positive or even neutral finding.

This is also not at all to say that program advocates should place themselves reflexively in the position of supporting programs, particularly programs which prove ineffective. Program advocates, indeed the social work profession should vigorously scrutinize its own works and make changes where needed. Credibility and vitality will only flow from a critical, responsive and innovative handling of social programming. Ultimately, the most destructive position any profession can take is to merely defend its vested interest.

Several concerns of relevance to social work are raised by this study. The most prominent are as follows:

1. Even given adequate evaluations of social programs, it is not evident how to choose among those programs for purposes of distributing the diminishing, and likely insufficient, resources now allocated to the social work sector. At the extremes, the decisions may not be difficult.

But, most social programs show mixed and ambiguous findings relative to efficacy and in such situations choosing among programs is problematic. For example, given the mixed results of this study, how does one decide whether funds are best spent on EPSDT or on some other specific social or health program? Such questions are not merely academic. The federal government initiative of placing health and social programs into block grants, with funds insufficient to finance all the programs, will force states into making exactly these types of decisions. Such choices are certainly not new. However, they are going to be more frequent, and of greater magnitude, in the near future than they were in the recent past. The welfare state of the 1960s was expansionary. The fiscal crises of the late 1970s could generally be handled by across-the-board reductions. The 1980s will see the elimination of entire programs. Social work will be fortunate if it is involved in such decisions (at the same time it has a role to play in resisting such changes). Accordingly, it will need a methodology for making these choices.

2. The combination of findings that participants not only benefitted from EPSDT (as evidenced by reduced referral rates) but also incurred lower medical costs than non-participants (program costs excluded) is very encouraging. The fact that these savings were offset by program costs raises a challenge to social work to reduce program costs-while maintaining quality programming-in order to realize overall Medicaid cost savings attributable to the program. A combination of participant benefits <u>and</u> cost savings would provide the strongest possible rationale for the program. The possibilities of strong program justification are present in the findings. The task is still to realize the potential.

3. The fact that EPSDT was governmentally initiated - with strong social work backing but without clear grassroots support - challenges the profession to appraise the program objectively and in consideration of its support by its eligible population. The most basic principle of social work's community organization is to involve recipients in the decisions and programs affecting their lives. The extent to which Medicaid recipients support EPSDT must be considered in combination with measures of the program's efficacy. The early history of EPSDT is unclear regarding the extent of recipient interest in the program. To the extent those in social work positions advocated for the program without a base of potential recipient support, they were professionally inconsistent in their lack of attention to recipient involvement. To the extent this omission continues, the profession runs the risk of institutionalizing the program to its own purposes and image.

Recommendations for Future Study

Future EPSDT research should focus on:

(1). The relationship between referral rates and rescreening.

(2). The relationship between program participation and medical costs.

(3). The question of whether EPSDT improves access to needed medical services. A central purpose of EPSDT was to increase the poor's access to "mainstream" medicine. Little attention has been given to whether this is occurring.

(4) The differential effectiveness of the various screening tests and procedures and the need for deleting and/or adding tests to the screening package.

Conclusions

The objective of this study was to better answer the question of whether EPSDT in Michigan is improving the health status of its participants. Analysis of referral rates indicates the program is having beneficial effects as evidenced by the existence of an inverse relationship between referral rates and rescreenings. Those with more screenings have fewer referrals. There is variance in this trend but the trend is consistent and clearly evident across the first four-five screenings, given groups of one hundred or more subjects. Similar analyses of cost data do not show the program to be associated with cost reductions but in fact to incur financial costs, at least in the period of time studied. It is possible that cost savings would be realized given longer recipient exposure to the program or if more indirect benefits of program participation could be measured. However, present indications are that the program is benefitting recipients but incurring a true cost. In the final analysis of the program's worth, the benefits to recipients - reductions of 10 percent or less in referrable conditions - must be balanced against true program costs of perhaps one-third to one million dollars annually or roughly \$3-\$10 per screening (\$.375 - \$1 million/105,000 screenings). Based upon this, and other, studies of EPSDT outcomes, the program merits continued support. However, considering the study's mixed results and the extraneous factors which appear to influence referral rates, this study also suggests that continued analysis of program outcomes is warranted. In conclusion, this study suggests the program is achieving modest gains at modest costs.

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APPENDICES

APPENDIX A

Table I(a). Number of long-term eligible screened by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
Under 1	331	13	0	1	0	0	0	345
1	614	47	4	0	0	0	0	665
2	980	153	17	3	1	0	0	1154
3	1492	463	70	4	1	0	0	2030
4	1975	1000	340	55	6	0	0	3376
5	2044	1257	606	145	27	3	0	4082
6	1768	1284	744	243	35	5	1	4080
7	1845	1505	925	263	55	2	0	4595
8	2218	1607	791	235	32	7	1	4891
9	2059	1563	793	234	36	0	3	4688
10	2120	1565	886	179	25	3	0	4778
11	2345	1829	774	213	23	3	0	5187
12	1818	1493	746	180	26	2	0	4265
13	1461	1539	760	146	17	2	0	3925
14	1093	1255	597	126	12	0	0	3083
15	622	946	480	113	14	2	0	2177
16	336	614	356	74	8	0	0	1388
17	245	369	209	33	7	0	0	863
18	73	116	83	25	2	1	0	300
19	46	58	39	5	1	0	0	149
20	10	6	8	1	0	0	0	25
Total	25,495	18,682	9,228	2,278	328	30	5	56,046

Table I(Aa). Number of long-term eligible whites screened by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
Under 1	140	6	0	0	0	0	0	146
1	274	19	1	0	0	0	0	294
2	464	63	11	1	1	0	0	540
3	701	237	37	1	0	0	0	976
4	992	504	161	27	4	0	0	1688
5	974	580	277	68	12	1	0	1912
6	879	598	342	107	10	4	0	1940
7	933	733	438	137	23	2	0	2266
8	1119	828	375	120	15	4	1	2462
9	1005	773	379	119	16	0	1	2293
10	1089	779	427	95	11	3	0	2404
11	1152	917	362	105	10	2	0	2548
12	893	709	339	77	13	2	0	2033
13	613	713	334	68	6	1	0	1735
14	467	571	257	52	9	0	0	1356
15	237	391	188	45	7	0	0	868
16	111	216	127	21	3	0	0	478
17	70	123	59	11	3	0	0	266
18	18	37	17	4	0	1	0	77
19	8	9	10	0	0	0	0	27
20	3	1	0	0	0	0	0	4
Total	12,142	8,807	4,141	1,058	143	20	2	26,313

Table I(Ba). Number of long-term eligible blacks screened by age and number of lifetime screenings.

Age	1	2	3	4	5	6	7	Total
	Number of Lifetime Screenings							
Under 1	183	6	0	0	0	0	0	189
1	332	26	3	0	0	0	0	361
2	497	84	6	2	0	0	0	589
3	758	209	28	3	1	0	0	999
4	932	470	159	27	2	0	0	1590
5	1014	630	301	69	14	2	0	2030
6	854	623	365	125	22	1	1	1991
7	857	722	446	114	25	0	0	2164
8	1039	714	386	99	12	3	0	2253
9	955	726	380	108	20	0	2	2191
10	964	718	422	77	11	0	0	2192
11	1140	837	379	95	12	0	0	2463
12	878	701	374	88	11	0	0	2052
13	813	748	387	69	11	1	0	2029
14	604	620	309	69	3	0	0	1605
15	369	505	278	64	7	2	0	1225
16	213	362	214	47	5	0	0	841
17	171	228	139	22	3	0	0	563
18	54	75	60	18	2	0	0	209
19	38	47	26	5	1	0	0	117
20	7	5	7	1	0	0	0	20
Total	12,672	9,056	4,669	1,102	162	9	3	27,673

Table I(Ca). Number of long-term eligible American Indians screened by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	Total
Under 1	1	0	0	0	0	1
1	3	0	0	0	0	3
2	1	0	0	0	0	1
3	5	2	0	0	0	7
4	3	6	1	0	0	10
5	9	3	8	2	0	22
6	3	7	2	2	2	16
7	6	5	4	1	2	18
8	13	7	1	4	2	27
9	5	3	3	1	0	12
10	7	6	2	1	1	17
11	8	9	4	2	1	24
12	6	11	7	2	0	26
13	2	9	5	0	0	16
14	3	6	6	0	0	15
15	3	7	2	0	0	12
16	1	5	1	0	0	7
17	0	1	0	0	0	1
18	0	0	2	1	0	3
19	0	0	0	0	0	0
20	0	0	0	0	0	0
Total	79	87	48	16	8	238

Table I(Da). Number of long-term eligible Spanish-speaking screened by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	Total
Under 1	6	1	0	1	0	0	8
1	4	2	0	0	0	0	6
2	18	6	0	0	0	0	24
3	25	14	5	0	0	0	44
4	46	19	18	1	0	0	84
5	40	38	18	6	1	0	103
6	27	53	31	6	1	0	118
7	44	43	36	11	5	0	139
8	39	56	29	12	3	0	139
9	29	57	29	5	0	0	120
10	41	54	34	5	2	0	136
11	38	63	28	11	0	1	141
12	36	63	24	13	2	0	138
13	28	62	33	9	0	0	132
14	14	53	22	5	0	0	94
15	10	39	10	4	0	0	63
16	8	26	12	6	0	0	52
17	4	17	8	0	1	0	30
18	1	4	3	2	0	0	10
19	0	2	3	0	0	0	5
20	0	0	0	0	0	0	0
Total	458	672	343	97	15	1	1,586

Table I(Ea). Number of long-term eligible males screened by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	Total
Under 1	167	9	0	1	0	0	177
1	298	20	1	0	0	0	319
2	504	72	6	1	1	0	584
3	755	246	32	3	1	0	1037
4	990	510	167	29	2	0	1698
5	1048	630	304	62	13	1	2058
6	889	624	387	116	19	3	2038
7	919	761	443	123	32	1	2279
8	1136	776	424	119	14	4	2473
9	1012	772	402	121	17	3	2327
10	1055	788	442	88	12	0	2385
11	1141	870	375	114	8	3	2511
12	916	722	392	94	14	1	2139
13	687	754	366	69	12	1	1889
14	502	610	290	66	5	0	1473
15	262	423	234	50	11	1	981
16	126	264	166	31	2	0	589
17	98	147	88	15	5	0	353
18	14	30	26	7	2	0	79
19	13	9	6	0	0	0	28
20	2	0	1	0	0	0	3
Total	12,534	9,037	4,552	1,109	170	18	27,420

Table I(Fa). Number of long-term eligible females screened by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	6	7	Total
Under 1	164	4	0	0	0	0	0	168
1	316	27	3	0	0	0	0	346
2	476	81	11	2	0	0	0	570
3	737	217	38	1	0	0	0	993
4	985	490	173	26	4	0	0	1678
5	996	627	302	83	14	2	0	2024
6	879	660	357	127	16	2	1	2042
7	926	744	482	140	23	1	0	2316
8	1082	831	367	116	18	3	1	2418
9	1047	791	391	113	19	0	0	2361
10	1065	777	444	91	13	3	0	2393
11	1204	959	399	99	15	0	0	2676
12	902	771	354	86	12	1	0	2126
13	774	785	394	77	5	1	0	2036
14	591	645	307	60	7	0	0	1610
15	360	523	246	63	3	1	0	1196
16	210	350	190	43	6	0	0	799
17	147	222	121	18	2	0	0	510
18	59	86	57	18	1	0	0	221
19	33	49	33	5	1	0	0	121
20	8	6	7	1	0	0	0	22
Total	12,961	9,645	4,676	1,169	159	14	2	28,626

Table I(Ga). Number of long-term eligible white males screened by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
Under 1	70	3	0	0	0	0	0	73
1	136	8	0	0	0	0	0	144
2	237	30	3	1	0	0	0	271
3	355	122	16	1	0	0	0	494
4	501	263	79	15	2	0	0	860
5	519	306	135	32	6	1	0	999
6	418	300	189	58	3	2	0	970
7	464	369	216	71	13	1	0	1134
8	553	415	207	64	7	1	0	1247
9	532	380	196	62	5	0	1	1176
10	545	408	223	48	5	0	0	1229
11	567	426	180	51	5	2	0	1231
12	448	348	175	41	6	1	0	1019
13	293	353	161	33	5	0	0	845
14	242	295	136	27	5	0	0	705
15	113	169	91	19	7	0	0	399
16	45	92	52	12	0	0	0	201
17	20	62	26	5	2	0	0	115
18	4	11	6	1	0	0	0	22
19	4	4	0	0	0	0	0	8
20	2	0	0	0	0	0	0	2
Total	6,068	4,364	2,091	541	71	8	1	13,144

Table I(Ha). Number of long-term eligible white females screened by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
Under 1	70	3	0	0	0	0	0	73
1	138	11	1	0	0	0	0	150
2	227	33	8	1	0	0	0	269
3	346	115	21	0	0	0	0	482
4	491	241	82	12	2	0	0	828
5	455	274	142	36	6	0	0	913
6	461	298	153	49	7	2	0	970
7	469	364	222	66	10	1	0	1132
8	566	413	168	56	8	3	1	1215
9	523	393	183	57	11	0	0	1167
10	544	371	204	47	6	3	0	1175
11	585	491	182	54	5	0	0	1317
12	445	361	164	36	7	1	0	1014
13	320	360	173	35	1	1	0	890
14	225	276	121	25	4	0	0	651
15	124	222	97	26	0	0	0	469
16	66	124	75	9	3	0	0	277
17	50	61	33	6	1	0	0	151
18	14	26	11	3	1	0	0	55
19	4	5	10	0	0	0	0	19
20	1	1	0	0	0	0	0	2
Total	6,124	4,443	2,050	518	72	11	1	13,219

Table I(Ia). Number of long-term eligible black males screened by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
Under 1	93	5	0	0	0	0	0	98
1	158	12	1	0	0	0	0	171
2	255	40	3	1	0	0	0	299
3	388	112	14	2	1	0	0	517
4	460	235	79	13	0	0	0	787
5	503	303	154	28	6	0	0	994
6	450	297	171	54	14	1	0	987
7	421	369	206	48	12	0	0	1056
8	553	328	197	48	5	3	0	1134
9	454	364	191	55	12	0	2	1078
10	480	345	198	40	5	0	0	1068
11	553	417	179	55	2	0	0	1206
12	441	334	201	49	6	0	0	1031
13	376	364	188	34	7	1	0	970
14	251	283	137	36	0	0	0	707
15	146	230	134	28	4	1	0	543
16	78	158	106	17	2	0	0	361
17	74	77	57	10	2	0	0	220
18	9	17	18	6	2	0	0	52
19	9	4	6	0	0	0	0	19
20	0	0	0	0	0	0	0	0
Total	6,152	4,294	2,240	524	80	6	2	13,298

Table I(Ja). Number of long-term eligible black females screened by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
Under 1	90	1	0	0	0	0	0	91
1	174	14	2	0	0	0	0	190
2	242	44	3	1	0	0	0	290
3	370	97	14	1	0	0	0	482
4	472	235	80	14	2	0	0	803
5	511	327	147	41	8	2	0	1036
6	404	326	194	71	8	0	1	1004
7	436	353	240	66	13	0	0	1108
8	486	386	189	51	7	0	0	1119
9	501	362	189	53	8	0	0	1113
10	484	373	224	37	6	0	0	1124
11	587	420	200	40	10	0	0	1257
12	437	367	173	39	5	0	0	1021
13	437	384	199	35	4	0	0	1059
14	353	337	172	33	3	0	0	898
15	223	275	144	36	3	1	0	682
16	135	204	108	30	3	0	0	480
17	97	151	82	12	1	0	0	343
18	45	58	42	12	0	0	0	157
19	29	43	20	5	1	0	0	98
20	7	5	7	1	0	0	0	20
Total	6,520	4,762	2,429	578	82	3	1	14,375

Table I(Ka). Number of long-term eligible American Indian males screened by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	Total
Under 1	1	0	0	0	0	1
1	3	0	0	0	0	3
2	1	0	0	0	0	1
3	2	2	0	0	0	4
4	1	1	1	0	0	3
5	4	0	4	2	0	10
6	2	6	1	0	1	10
7	3	1	2	1	2	9
8	6	4	1	4	0	15
9	2	2	2	1	0	7
10	4	4	1	0	1	10
11	2	1	2	2	1	8
12	4	5	3	1	0	13
13	1	2	2	0	0	5
14	2	3	2	0	0	7
15	1	2	1	0	0	4
16	0	2	0	0	0	2
17	0	0	0	0	0	0
18	0	0	2	0	0	2
19	0	0	0	0	0	0
20	0	0	0	0	0	0
Total	39	35	24	11	5	114

Table I(La). Number of long-term eligible American Indian females screened by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	Total
Under 1	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	3	0	0	0	0	3
4	2	5	0	0	0	7
5	5	3	4	0	0	12
6	1	1	1	2	1	6
7	3	4	2	0	0	9
8	7	3	0	0	2	12
9	3	1	1	0	0	5
10	3	2	1	1	0	7
11	6	8	2	0	0	16
12	2	6	4	1	0	13
13	1	7	3	0	0	11
14	1	3	4	0	0	8
15	2	5	1	0	0	8
16	1	3	1	0	0	5
17	0	1	0	0	0	1
18	0	0	0	1	0	1
19	0	0	0	0	0	0
20	0	0	0	0	0	0
Total	40	52	24	5	3	124

Table I(Ma). Number of long-term eligible Spanish-speaking males screened by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	Total
Under 1	2	1	0	1	0	0	4
1	1	0	0	0	0	0	1
2	11	2	0	0	0	0	13
3	8	9	2	0	0	0	19
4	26	10	8	1	0	0	45
5	17	18	10	0	1	0	46
6	15	21	22	3	1	0	62
7	26	21	18	3	5	0	73
8	19	28	19	3	2	0	71
9	16	24	12	3	0	0	55
10	18	29	19	0	1	0	67
11	14	25	13	6	0	1	59
12	21	32	11	3	2	0	69
13	16	33	14	2	0	0	65
14	5	27	14	3	0	0	49
15	1	21	7	3	0	0	32
16	2	11	7	2	0	0	22
17	4	8	2	0	1	0	15
18	1	2	0	0	0	0	3
19	0	1	0	0	0	0	1
20	0	0	0	0	0	0	0
Total	223	323	178	33	13	1	771

Table I(Na). Number of long-term eligible Spanish-speaking females screened by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	Total
Under 1	4	0	0	0	0	4
1	3	2	0	0	0	5
2	7	4	0	0	0	11
3	17	5	3	0	0	25
4	20	9	10	0	0	39
5	23	20	8	6	0	57
6	12	32	9	3	0	56
7	18	22	18	8	0	66
8	20	28	10	9	1	68
9	13	33	17	2	0	65
10	23	25	15	5	1	69
11	24	38	15	5	0	82
12	15	31	13	10	0	69
13	12	29	19	7	0	67
14	9	26	8	2	0	45
15	9	18	3	1	0	31
16	6	15	5	4	0	30
17	0	9	6	0	0	15
18	0	2	3	2	0	7
19	0	1	3	0	0	4
20	0	0	0	0	0	0
Total	235	349	165	64	2	815

Table I(0a). Number of long-term eligible participants screened in Detroit by age and number of lifetime screenings.

Age	Number of Lifetime Screenings: 1	2	3	4	5	6	7	Total
Under 1	87	2	0	0	0	0	0	89
1	217	12	3	0	0	0	0	232
2	326	22	0	0	0	0	0	348
3	494	68	7	1	1	0	0	571
4	552	111	25	5	2	0	0	695
5	639	229	62	10	5	1	0	946
6	543	198	56	28	7	0	0	832
7	546	236	79	12	9	0	0	882
8	692	231	60	16	5	2	0	1006
9	584	259	59	15	5	0	1	923
10	590	225	70	8	5	0	0	898
11	712	334	67	16	0	0	0	1129
12	511	231	59	12	3	0	0	816
13	478	252	52	14	2	0	0	798
14	352	207	58	11	1	0	0	629
15	199	179	43	10	0	0	0	431
16	94	113	29	7	2	0	0	245
17	95	76	19	2	1	0	0	193
18	20	20	9	4	1	0	0	54
19	17	16	3	1	0	0	0	37
20	4	2	1	0	0	0	0	7
Total	7,752	3,023	761	172	49	3	1	11,761

Table I(Pa). Number of long-term eligible participants screened in forty-four Northern Michigan counties by number of lifetime screenings.

	Number of Lifetime Screenings							
	1	2	3	4	5	6	7	Total
	1,752	1,462	755	250	43	12	2	4,276

APPENDIX B

Table I(Qa). Number of long-term eligibles screened in Detroit and Northern Michigan by race and number of lifetime screenings.

	Number of Lifetime Screenings							
Location/Race	1	2	3	4	5	6	7	Total
Detroit								
Whites	1,045	301	52	12	4	0	0	1,414
Blacks	6,627	2,674	693	160	45	3	1	10,203
Total	7,672	2,975	745	172	49	3	1	11,617
Northern Michigan								
Whites	1,611	1,389	667	225	39	10	2	3,943
Blacks	26	28	24	8	2	0	0	88
Total	1,637	1,417	691	233	41	10	2	4,031

Table II(a). Number of one-year eligibles screened by age and number of lifetime screenings.

	Total Lifetime Screenings								
Age	1	2	3	4	5	6	7	8	Total
Under 1	8523	579	16	3	0	0	0	0	9121
1	7605	1825	227	7	0	0	0	0	9664
2	6256	2429	389	43	7	1	0	0	9125
3	6702	3742	917	97	6	0	0	0	11464
4	6365	4259	1535	299	43	5	0	0	12506
5	5580	3552	1560	396	69	7	0	1	11165
6	4634	3056	1484	446	69	6	1	0	9696
7	4641	3332	1707	434	77	5	0	0	10196
8	4964	3295	1437	383	46	7	2	0	10134
9	4625	3056	1385	370	50	3	0	0	9489
10	4437	3099	1458	277	39	4	0	0	9314
11	4789	3234	1280	298	38	3	0	0	9642
12	3870	2717	1178	262	36	3	0	0	8066
13	3310	2696	1192	210	26	3	0	0	7437
14	2579	2279	931	173	15	1	0	0	5978
15	1715	1701	737	144	23	2	0	0	4322
16	976	1157	552	100	13	0	0	0	2798
17	799	709	347	46	13	0	0	0	1914
18	621	340	141	38	5	1	0	0	1146
19	475	215	86	15	1	0	0	0	792
20	122	67	23	3	2	0	0	0	217
Total	83,588	47,339	18,582	4,044	578	51	3	1	154,186

Table II(Aa). Number of one-year eligible whites screened by age and number of lifetime screenings.

	Total Lifetime Screenings								
Age	1	2	3	4	5	6	7	8	Total
Under 1	4281	290	5	0	0	0	0	0	4576
1	4056	989	121	2	0	0	0	0	5168
2	3574	1271	200	18	2	1	0	0	5066
3	3881	2142	507	52	2	0	0	0	6584
4	3902	2599	906	165	24	4	0	0	7600
5	3268	2038	884	232	35	3	0	1	6461
6	2793	1749	828	225	35	4	0	0	5634
7	2737	1926	947	238	45	5	0	0	5898
8	2881	1942	805	224	23	4	1	0	5880
9	2735	1788	757	199	24	0	1	0	5504
10	2621	1749	791	159	21	4	0	0	5345
11	2742	1842	703	157	21	2	0	0	5467
12	2213	1487	606	129	20	2	0	0	4457
13	1757	1430	599	104	15	2	0	0	3907
14	1327	1239	436	84	12	0	0	0	3098
15	839	848	340	62	11	0	0	0	2100
16	441	491	228	33	5	0	0	0	1639
17	363	282	120	17	5	0	0	0	787
18	310	128	39	10	1	1	0	0	489
19	224	77	24	5	0	0	0	0	330
20	76	28	5	0	1	0	0	0	110
Total	47,021	26,335	9,851	2,115	302	32	2	1	85,659

Table II(Ba). Number of one-year eligible blacks screened by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
Under 1	3938	267	11	2	0	0	0	4218
1	3289	752	98	5	0	0	0	4144
2	2473	1044	175	25	5	0	0	3722
3	2612	1433	356	43	4	0	0	4448
4	2220	1478	543	115	17	1	0	4374
5	2132	1357	595	135	30	3	0	4252
6	1690	1148	569	195	30	2	1	3635
7	1717	1262	669	169	25	0	0	3842
8	1895	1190	561	130	17	3	1	3797
9	1731	1122	548	147	22	0	2	3572
10	1640	1174	595	102	15	0	0	3526
11	1888	1222	510	120	14	0	0	3754
12	1508	1072	512	110	14	1	0	3217
13	1420	1112	528	94	11	1	0	3166
14	1151	913	438	83	3	0	0	2588
15	792	754	363	73	11	2	0	1995
16	491	587	291	60	7	0	0	1436
17	396	383	204	26	6	0	0	1015
18	281	190	92	22	4	0	0	589
19	226	128	55	9	1	0	0	419
20	41	38	16	3	1	0	0	99
Total	33,531	18,626	7,729	1,668	237	13	4	61,808

Table II(Ca). Number of one-year eligible American Indians screened by age and number of lifetime screenings.

Age	Number of Lifetime Screenings: 1	2	3	4	5	6	Total
Under 1	28	1	0	0	0	0	29
1	28	12	0	0	0	0	40
2	37	11	1	0	0	0	49
3	23	18	4	0	0	0	45
4	23	28	11	2	0	0	64
5	27	17	11	5	-	1	61
6	19	17	10	3	2	0	51
7	18	19	13	2	2	0	54
8	30	19	5	5	2	0	61
9	17	12	14	5	1	0	49
10	22	19	10	3	1	0	55
11	14	18	6	6	1	0	45
12	17	27	10	2	0	0	56
13	14	16	10	0	0	0	40
14	10	12	12	0	0	0	34
15	5	13	5	0	1	0	24
16	5	12	2	0	0	0	19
17	3	4	3	0	1	0	11
18	1	2	3	2	0	0	8
19	3	1	2	0	0	0	6
20	1	0	0	0	0	0	1
Total	345	278	132	35	11	1	802

Table II(Da). Number of one-year eligible Spanish-speaking screened by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	Total
Under 1	239	20	0	1	0	0	260
1	191	61	5	0	0	0	257
2	141	93	13	0	0	0	247
3	153	130	46	2	0	0	331
4	180	138	70	16	2	0	406
5	126	120	64	24	4	0	338
6	104	126	71	18	2	0	321
7	136	115	71	25	5	0	352
8	125	131	65	24	4	0	349
9	109	124	62	18	3	0	316
10	115	134	60	12	2	0	323
11	118	139	60	15	2	1	335
12	113	115	47	21	2	0	298
13	87	120	54	12	0	0	273
14	67	104	41	6	0	1	219
15	55	73	25	9	0	0	162
16	28	53	28	7	1	0	117
17	28	35	16	3	1	0	83
18	16	15	6	3	0	0	40
19	13	8	5	1	0	0	27
20	2	1	1	0	0	0	4
Total	2,146	1,855	810	217	28	2	5,058

Table II(Ea). Number of one-year eligible males screened by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
Under 1	4342	297	12	1	0	0	0	4652
1	3856	933	116	1	0	0	0	4906
2	3155	1257	197	22	4	1	0	4636
3	3392	1879	458	56	4	0	0	5789
4	3145	2148	775	147	25	3	0	6243
5	2860	1817	795	188	36	3	0	5699
6	2314	1517	741	230	39	3	0	4844
7	2348	1663	856	203	44	4	0	5118
8	2545	1612	741	200	22	4	1	5125
9	2314	1515	681	200	23	3	0	4736
10	2210	1568	725	148	16	1	0	4668
11	2345	1537	632	164	13	3	0	4694
12	1926	1326	598	126	18	2	0	3996
13	1568	1319	576	95	14	2	0	3574
14	1152	1090	452	88	5	1	0	2788
15	709	773	361	64	15	1	0	1923
16	339	490	255	46	5	0	0	1135
17	230	238	142	22	8	0	0	640
18	48	63	36	10	2	0	0	159
19	22	17	8	2	0	0	0	49
20	6	3	1	0	0	0	0	10
Total	40,826	23,062	9,158	2,013	293	31	1	75,384

Table II(Fa). Number of one-year eligible females screened by age and number of lifetime screenings.

Age	Total Lifetime Screenings 1	2	3	4	5	6	7	8	Total
Under 1	4181	282	4	2	0	0	0	0	4469
1	3749	892	111	6	0	0	0	0	4758
2	3101	1172	192	21	3	0	0	0	4489
3	3310	1863	459	41	2	0	0	0	5675
4	3220	2111	760	152	18	2	0	0	6263
5	2720	1735	765	208	33	4	0	1	5466
6	2320	1539	743	216	30	3	1	0	4852
7	2293	1669	851	231	33	1	0	0	5078
8	2419	1683	696	183	24	3	1	0	5009
9	2311	1541	704	170	27	0	0	0	4753
10	2227	1531	733	129	23	3	0	0	4646
11	2444	1697	648	134	25	0	0	0	4948
12	1944	1391	580	136	18	1	0	0	4070
13	1742	1377	616	115	12	1	0	0	3863
14	1427	1189	479	85	10	0	0	0	3190
15	1006	928	376	80	8	1	0	0	2399
16	637	667	297	54	8	0	0	0	1663
17	569	471	205	24	5	0	0	0	1274
18	573	277	105	28	3	1	0	0	987
19	453	198	78	13	1	0	0	0	743
20	116	64	22	3	2	0	0	0	207
Total	42,762	24,277	9,424	2,031	285	20	2	1	78,802

Table II(Ga). Number of one-year elgible white males screened by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
Under 1	2241	156	4	0	0	0	0	2401
1	2071	505	64	0	0	0	0	2640
2	1816	668	104	7	1	1	0	2597
3	1950	1072	254	30	2	0	0	3308
4	1949	1325	471	84	13	3	0	3845
5	1699	1056	458	114	20	2	0	3349
6	1372	885	418	120	21	2	0	2818
7	1392	973	484	121	25	4	0	2999
8	1482	949	413	122	13	1	0	2980
9	1383	889	372	109	9	0	1	2763
10	1311	899	402	90	8	1	0	2711
11	1354	859	356	84	9	2	0	2664
12	1106	727	299	61	7	1	0	2201
13	859	696	288	50	7	1	0	1901
14	631	610	216	41	5	0	0	1503
15	365	383	163	27	9	0	0	947
16	160	213	96	18	1	0	0	488
17	91	109	47	9	3	0	0	259
18	24	25	10	3	0	0	0	62
19	6	8	1	2	0	0	0	17
20	4	0	0	0	0	0	0	4
Total	23,266	13,007	4,920	1,092	153	18	1	42,457

Table II(Ha). Number of one-year eligible white females screened by age and number of lifetime screenings.

	Total Lifetime Screenings								
Age	1	2	3	4	5	6	7	8	Total
Under 1	2040	134	1	0	0	0	0	0	2175
1	1985	484	57	2	0	0	0	0	2528
2	1758	603	96	11	1	0	0	0	2469
3	1931	1070	253	22	0	0	0	0	3276
4	1953	1274	435	81	11	1	0	0	3755
5	1569	982	426	118	15	1	0	1	3112
6	1421	864	410	105	14	2	0	0	2816
7	1345	953	463	117	20	1	0	0	2899
8	1399	993	392	102	10	3	1	0	2900
9	1352	899	385	90	15	0	0	0	2741
10	1310	850	389	69	13	3	0	0	2634
11	1388	983	347	73	12	0	0	0	2803
12	1107	760	307	68	13	1	0	0	2256
13	898	734	311	54	8	1	0	0	2006
14	696	629	220	43	7	0	0	0	1595
15	474	465	177	35	2	0	0	0	1153
16	281	278	132	15	4	0	0	0	710
17	272	173	73	8	2	0	0	0	528
18	286	103	29	7	1	1	0	0	427
19	218	69	23	3	0	0	0	0	313
20	72	28	5	0	1	0	0	0	106
Total	23,755	13,328	4,931	1,023	149	14	1	1	43,202

Table II(Ia). Number of one-year eligible black males screened by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	6	7	Total
Under 1	1951	130	8	0	0	0	0	2089
1	1656	380	47	1	0	0	0	2084
2	1242	527	87	15	3	0	0	1874
3	1337	729	180	24	2	0	0	2272
4	1075	733	264	54	10	0	0	2136
5	1064	684	292	60	12	0	0	2112
6	855	563	273	98	16	1	0	1806
7	857	630	321	75	12	0	0	1895
8	969	574	288	64	6	3	1	1905
9	849	560	274	77	14	0	2	1776
10	814	584	285	54	6	0	0	1743
11	915	598	250	68	2	0	0	1833
12	736	521	267	56	9	1	0	1590
13	643	547	260	42	7	1	0	1500
14	478	415	209	43	0	0	0	1145
15	300	336	181	32	5	1	0	855
16	166	243	141	25	3	0	0	578
17	125	113	85	10	4	0	0	337
18	20	33	21	7	2	0	0	83
19	15	7	6	0	0	0	0	28
20	1	2	0	0	0	0	0	3
Total	16,068	8,909	3,739	805	113	7	3	29,644

Table II(Ja). Number of one-year eligible black females screened by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
Under 1	1986	137	3	2	0	0	0	2128
1	1633	372	51	4	0	0	0	2060
2	1231	517	88	10	2	0	0	1848
3	1275	714	176	19	2	0	0	2186
4	1145	745	279	61	7	1	0	2238
5	1068	673	303	75	18	3	0	2140
6	835	585	296	97	14	1	1	1829
7	860	632	348	94	13	0	0	1947
8	926	616	273	66	11	0	0	1892
9	882	562	274	70	8	0	0	1796
10	826	590	310	48	9	0	0	1783
11	973	624	260	52	12	0	0	1921
12	772	551	245	54	5	0	0	1627
13	777	565	268	52	4	0	0	1666
14	673	498	229	40	3	0	0	1443
15	492	418	182	41	6	1	0	1140
16	325	344	150	35	4	0	0	858
17	271	270	119	16	2	0	0	678
18	261	157	71	15	2	0	0	506
19	211	121	49	9	1	0	0	391
20	40	36	16	3	1	0	0	96
Total	17,462	9,727	3,990	863	124	6	1	32,173

Table II(Ka). Number of one-year eligible American Indian males screened by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	6	Total
Under 1	15	0	0	0	0	0	15
1	13	5	0	0	0	0	18
2	17	6	0	0	0	0	23
3	15	9	3	0	0	0	27
4	11	13	6	1	0	0	31
5	16	6	7	2	0	1	32
6	15	10	4	1	1	0	31
7	8	6	9	2	2	0	27
8	13	10	3	4	0	0	30
9	10	4	6	3	0	0	23
10	12	11	7	0	1	0	31
11	6	7	2	3	1	0	19
12	13	16	4	1	0	0	34
13	7	5	4	0	0	0	16
14	4	8	2	0	0	0	14
15	3	4	4	0	1	0	12
16	0	7	1	0	0	0	8
17	1	2	2	0	0	0	5
18	0	0	3	0	0	0	3
19	0	0	1	0	0	0	1
20	0	0	0	0	0	0	0
Total	179	129	68	17	6	1	400

Table II(L). Number of one-year eligible American Indian females screened by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	Total
Under 1	13	1	0	0	0	14
1	15	7	0	0	0	22
2	20	5	1	0	0	26
3	8	9	1	0	0	18
4	12	15	5	1	0	33
5	11	11	4	3	0	29
6	4	7	6	2	1	20
7	10	13	4	0	0	27
8	17	9	2	1	2	31
9	7	8	8	2	1	26
10	10	8	3	3	0	24
11	8	11	4	3	0	26
12	4	11	6	1	0	22
13	7	11	6	0	0	24
14	6	4	10	0	0	20
15	2	9	1	0	0	12
16	5	5	1	0	0	11
17	2	2	1	0	1	6
18	1	2	0	2	0	5
19	3	1	1	0	0	5
20	1	0	0	0	0	1
Total	166	149	64	18	5	402

Table II(Ma). Number of one-year eligible Spanish-speaking males screened by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	Total
Under 1	116	11	0	1	0	0	128
1	98	35	3	0	0	0	136
2	66	50	6	0	0	0	122
3	73	65	18	2	0	0	158
4	92	70	33	8	2	0	205
5	65	60	35	12	4	0	176
6	57	50	42	8	1	0	158
7	74	47	37	5	5	0	168
8	65	70	36	10	3	0	184
9	57	59	27	11	0	0	154
10	55	68	29	4	1	0	157
11	57	65	23	9	1	1	156
12	60	59	26	8	2	0	155
13	43	62	23	3	0	0	131
14	27	53	24	4	0	1	109
15	25	42	11	5	0	0	83
16	6	19	16	3	1	0	45
17	10	10	5	3	1	0	29
18	2	3	2	0	0	0	7
19	0	1	0	0	0	0	1
20	0	1	0	0	0	0	1
Total	1,048	900	396	96	21	2	2,463

Table II(Na). Number of one-year eligible Spanish-speaking females screened by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	Total
Under 1	123	9	0	0	0	132
1	93	26	2	0	0	121
2	75	43	7	0	0	125
3	80	65	28	0	0	173
4	88	68	37	8	0	201
5	61	60	29	12	0	162
6	47	76	29	10	1	163
7	62	68	34	20	0	184
8	60	61	29	14	1	165
9	52	65	35	7	3	162
10	60	66	31	8	1	166
11	61	74	37	6	1	179
12	53	56	21	13	0	143
13	44	58	31	9	0	142
14	40	51	17	2	0	110
15	30	31	14	4	0	79
16	22	34	12	4	0	72
17	18	25	11	0	0	54
18	14	12	4	3	0	33
19	13	7	5	1	0	26
20	2	0	1	0	0	3
Total	1,098	955	414	121	7	2,595

Table II(0a). Number of one-year eligible participants screened in Detroit by number of lifetime screenings.

Number of Lifetime Screenings							
1	2	3	4	5	6	7	Total
18,473	5,691	1,250	280	76	3	1	25,774

Table II(Pa). Number of one-year eligible participants screened in forty-four Northern Michigan counties by number of lifetime screenings.

Number of Lifetime Screenings							
1	2	3	4	5	6	7	Total
7,497	4,813	2,031	504	80	17	3	14,945

Table II(Qa). Number of one-year eligibles screened in Detroit and Northern Michigan by race and number of lifetime screenings.

Location/Race	Number of Lifetime Screenings 1	2	3	4	5	6	7	Total
Detroit								
Whites	2,688	709	95	22	5	0	0	3,519
Blacks	15,312	4,825	1,119	255	68	3	1	21,583
Total	18,000	5,534	1,214	277	73	3	1	25,102
Northern Michigan								
Whites	7,517	4,535	1,897	455	69	16	2	14,491
Blacks	112	78	45	18	2	0	1	256
Total	7,269	4,613	1,942	473	71	16	3	14,387

APPENDIX C

Table III. Average number of referrals at last screening in 1978 for long-term eligibles by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
1	.500	-	-	-	-	-	-
2	.250	.500	-	-	-	-	-
3	.583	.666	-	-	-	-	-
4	.800	.428	.333	-	-	-	-
5	1.222	.418	.766	1.000	2.000	-	-
6	.983	.845	.907	.746	.666	-	-
7	1.107	.993	.817	.866	.800	-	-
8	.889	.868	.834	.561	1.111	-	-
9	.995	.919	.841	.656	.428	-	-
10	.982	.872	.851	.698	.600	-	1.000
11	.982	.862	.745	.979	.777	-	-
12	1.051	.860	.821	.838	.667	-	-
13	1.049	.813	.804	.520	1.000	-	-
14	1.057	.843	.948	.763	1.500	-	-
15	.977	.882	.952	.928	1.750	-	-
16	1.196	.912	.993	.793	.500	-	-
17	1.086	1.027	.997	1.285	1.000	-	-
18	1.397	1.054	.881	.833	1.000	-	-
19	1.357	1.137	2.058	1.000	-	-	-
20	1.366	1.157	1.000	-	-	-	-
Grand Mean	1.036	.884	.868	.765	.852	-	1.000
% Change As No. Screenings In creased By One		-15%	-2%	-12%	+11%		+17%

Table III(A). Average number of referrals at last screening in 1978 for long-term eligible whites by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
1	0	-	-	-	-
2	.333	0	-	-	-
3	0	.666	-	-	-
4	.666	.500	1.000	-	-
5	1.222	.428	.866	0	-
6	1.036	.803	.826	.815	.714
7	1.129	.984	.928	.852	1.000
8	.905	.817	.790	.526	1.000
9	.900	.810	.797	.666	.250
10	.766	.760	.774	.516	.666
11	.836	.788	.687	.695	.833
12	.912	.761	.691	.735	.333
13	.816	.823	.715	.444	1.000
14	.944	.816	.876	.681	1.000
15	.886	.813	.866	.666	2.000
16	1.095	.838	.942	.600	0
17	1.134	1.017	.974	1.500	-
18	.920	1.054	1.000	1.000	-
19	1.416	.562	2.666	-	-
20	.666	1.500	1.000	-	-
Grand Mean	.932	.817	.814	.682	.815
% Change As No. Screenings Increased By One		-12%	-0%	-16%	+20%

Table III(B). Average number of referrals at last screening in 1978 for long-term eligible blacks by age and number of lifetime scrrenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
1	-	-	-	-	-	-	-
2	0	1.000	-	-	-	-	-
3	.636	-	-	-	-	-	-
4	.909	0	0	-	-	-	-
5	1.250	.428	.666	1.090	2.000	-	-
6	.969	.839	.960	.656	.600	-	-
7	1.119	1.012	.707	.972	.500	-	-
8	.887	.915	.877	.645	1.000	-	-
9	1.097	1.004	.953	.700	1.000	-	-
10	1.171	.975	.934	.947	.500	-	1.000
11	1.161	.964	.826	1.272	0	-	-
12	1.205	.984	.978	1.000	1.000	-	-
13	1.319	.812	.869	.518	-	-	-
14	1.157	.871	.992	.916	-	-	-
15	1.094	.958	1.047	1.133	1.000	-	-
16	1.292	1.015	1.023	1.000	1.000	-	-
17	1.039	1.036	.977	1.142	1.000	-	-
18	1.636	1.050	.814	1.000	1.000	-	-
19	1.312	1.390	1.666	1.000	-	-	-
20	1.444	1.117	1.000	-	-	-	-
Grand Mean	1.144	.948	.921	.876	.826	-	-
% Change As No. Screenings Increased By One		-17%	-3%	-5%	-6%		+21%

Table III(C). Average number of referrals at last screening in 1978 for long-term eligible American Indians by age and number of lifetime screenings.

	Number of Lifetime Screenings			
Age	1	2	3	4
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	0	1.500	0	-
7	-	.500	0	-
8	0	-	-	0
9	0	2.000	-	-
10	0	1.000	-	-
11	0	0	-	1.000
12	1.000	1.333	-	0
13	1.500	0	.500	-
14	-	1.000	2.000	1.000
15	-	.333	.500	-
16	1.000	.500	-	-
17	-	0	-	-
18	2.000	-	-	-
19	-	-	-	-
20	-	-	-	-
Grand Mean	.666	.772	.571	.600
% Change As No. Screenings In-crased By One		+17%	-26%	+5%

Table III(D). Average number of referrals at last screening in 1978 for long-term eligible Spanish-speaking by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
1	1.000	-	-	-	-
2	-	-	-	-	-
3	-	-	-	-	-
4	-	-	0	-	-
5	1.000	0	-	-	-
6	.333	1.200	.923	1.000	-
7	.333	.933	1.000	.250	-
8	.833	.923	.842	.333	1.500
9	1.200	1.416	.444	0	0
10	.500	.800	.857	1.000	-
11	.600	.285	.466	1.000	1.000
12	1.000	.571	.615	1.000	-
13	1.333	.800	1.000	1.000	-
14	.833	.708	.941	.500	2.000
15	-	.842	.600	1.000	-
16	2.000	.611	1.000	-	-
17	1.000	1.200	1.000	1.000	-
18	.500	.250	2.000	0	1.000
19	-	0	2.000	-	-
20	-	-	1.000	-	-
Grand Mean	.811	.799	.794	.666	1.142
% Change As No. Screenings Increase By One		-1%	-0%	-16%	+72%

Table III(E). Average number of referrals at last screening in 1978 for long-term eligible males by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
1	-	-	-	-	-	-	-
2	.333	-	-	-	-	-	-
3	.444	1.000	-	-	-	-	-
4	1.166	.250	.500	-	-	-	-
5	1.727	.333	.571	1.125	2.000	-	-
6	1.040	.892	.894	.593	.500	-	-
7	1.039	1.128	.760	1.000	1.000	-	-
8	.852	.817	.766	.609	1.333	-	-
9	.919	.978	.854	.707	.400	-	-
10	.944	.858	.870	.520	1.000	-	1.000
11	1.030	.905	.704	.894	.750	-	-
12	1.158	.890	.771	.909	0	-	-
13	.929	.804	.842	.578	-	-	-
14	1.043	.821	.992	.647	2.000	-	-
15	.858	.812	.898	1.200	1.500	-	-
16	1.113	.894	.986	.571	.500	-	-
17	.895	.978	.843	1.166	-	-	-
18	1.236	.957	.827	.500	1.000	-	-
19	1.142	1.076	3.000	1.000	-	-	-
20	1.833	2.000	1.000	-	-	-	-
Grand Mean	1.005	.886	.835	.754	.906		1.000
% Change As No. Screenings Increased By One		-13%	-6%	-10%	+20%		+10%

Table III(F). Average number of referrals at last screening in 1978 for long-term eligible females by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
1	.500	-	-	-	-
2	0	.500	-	-	-
3	1.000	0	-	-	-
4	.250	.666	0	-	-
5	.875	.500	.937	.750	-
6	.927	.793	.920	.871	.700
7	1.180	.859	.890	.791	0
8	.931	.913	.913	.500	.666
9	1.062	.865	.831	.576	.500
10	1.030	.887	.827	.857	.500
11	.944	.820	.789	1.034	.800
12	.958	.831	.870	.758	1.000
13	1.146	.821	.764	.482	1.000
14	1.074	.862	.904	.857	1.000
15	1.104	.943	.993	.615	2.000
16	1.269	.927	1.000	1.000	-
17	1.250	1.071	1.100	1.375	1.000
18	1.533	1.066	.933	1.000	-
19	1.428	1.155	1.933	1.000	-
20	1.250	1.111	1.000	-	-
Grand Mean	1.066	.882	.901	.776	.805
% Change As No. Screenings Increase By One		-17%	+2%	-14%	+4%

Table III(G). Average number of referrals at last screening in 1978 for long-term eligible white males by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
1	-	-	-	-	-
2	.500	-	-	-	-
3	0	1.000	-	-	-
4	1.000	.333	1.000	-	-
5	1.571	.166	.750	0	-
6	1.074	.878	.666	.600	1.000
7	1.071	1.132	.814	.944	1.000
8	.814	.830	.806	.650	1.333
9	.983	.881	.853	.689	.333
10	.800	.776	.876	.352	-
11	.976	.870	.681	.777	.666
12	.985	.838	.682	.882	0
13	.637	.800	.620	.666	-
14	.913	.870	1.000	.555	-
15	.820	.814	.833	.857	1.500
16	1.026	.842	.968	.555	0
17	.928	.909	.722	1.333	-
18	.857	1.136	1.250	1.000	-
19	1.250	1.000	2.000	-	-
20	1.000	2.000	-	-	-
Grand Mean	.917	.859	.797	.692	.823
% Change As No. Screenings Increase By One		-6%	-7%	-13%	+19%

Table III(H). Average number of referrals at last screening in 1978 for long-term eligible white females by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
1	0	-	-	-	-
2	0	0	-	-	-
3	-	0	-	-	-
4	0	.666	-	-	-
5	1.000	.625	1.000	-	-
6	1.000	.723	.967	1.055	.666
7	1.192	.828	1.333	.750	-
8	1.024	.806	.771	.388	.500
9	.819	.729	.744	.625	0
10	.714	.743	.650	.714	.666
11	.746	.701	.694	.642	1.000
12	.853	.686	.701	.588	.500
13	.983	.842	.796	.222	1.000
14	.982	.767	.763	.769	1.000
15	.964	.813	.890	.400	3.000
16	1.152	.835	.921	.666	-
17	1.375	1.120	1.190	1.666	-
18	.944	.933	.714	-	-
19	1.500	.416	2.800	-	-
20	0	1.000	1.000	-	-
Grand Mean	.946	.777	.833	.671	.809
% Change As No. Screenings Increase By One		-18%	+8%	-19%	+20%

Table III(I). Average number of referrals at last screening in 1978 for long-term eligible black males by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
1	-	-	-	-	-	-	-
2	0	-	-	-	-	-	-
3	.500	-	-	-	-	-	-
4	1.333	0	-	-	-	-	-
5	2.000	.625	.333	1.285	2.000	-	-
6	1.026	.861	1.061	.583	0	-	-
7	1.065	1.123	.698	1.111	1.000	-	-
8	.875	.800	.721	.600	1.000	-	-
9	.862	1.052	.882	.818	1.000	-	-
10	1.074	.906	.865	.875	1.000	-	1.000
11	1.115	.963	.746	1.000	-	-	-
12	1.333	.953	.912	.923	0	-	-
13	1.368	.809	.971	.444	-	-	-
14	1.138	.789	.955	.714	-	-	-
15	.913	.858	.925	1.500	-	-	-
16	1.195	1.024	.974	.600	1.000	-	-
17	.842	1.050	.829	1.000	-	-	-
18	1.379	.931	.666	-	1.000	-	-
19	1.000	1.250	4.000	1.000	-	-	-
20	2.250	-	1.000	-	-	-	-
Grand Mean	1.097	.916	.867	.846	.888	-	1.000
% Change As No. Screenings Increased By One		-16%	-5%	-2%	+5%		+13%

Table III(J). Average number of referrals at last screening in 1978 for long-term eligible black females by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
1	-	-	-	-	-
2	-	1.000	-	-	-
3	1.000	-	-	-	-
4	.400	-	0	-	-
5	.500	.166	.888	.750	-
6	.909	.814	.840	.700	.750
7	1.173	.903	.716	.925	0
8	.898	1.022	1.054	.727	1.000
9	1.290	.986	1.000	.555	1.000
10	1.278	1.040	1.018	1.000	0
11	1.207	.965	.904	1.500	0
12	1.081	1.015	1.024	1.100	1.500
13	1.285	.815	.730	.555	-
14	1.177	.946	1.033	1.200	-
15	1.265	1.053	1.138	.714	1.000
16	1.390	1.009	1.062	1.222	-
17	1.156	1.023	1.106	1.250	1.000
18	1.923	1.145	.954	1.000	-
19	1.384	1.424	1.375	1.000	-
20	1.304	1.117	1.000	-	-
Grand Mean	1.186	.978	.972	.901	.785
% Change As No. Screenings Increase By One		-18%	-0%	-7%	-12%

Table III(K). Average number of referrals at last screening in 1978 for long-term eligible American Indian males by age and number of lifetime screenings.

	Number of Lifetime Screenings			
Age	1	2	3	4
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	0	1.000	0	-
7	-	-	-	-
8	0	-	-	-
9	-	-	-	-
10	-	2.000	-	-
11	0	0	-	-
12	-	1.000	-	0
13	1.500	-	-	-
14	-	1.000	-	-
15	-	0	.500	-
16	-	0	-	-
17	-	-	-	-
18	-	-	-	-
19	-	-	-	-
20	-	-	-	-
Grand Mean	.600	.625	.333	0
% Change As No. Screenings Increase By One		+4%	-47%	-100%

Table III(L). Average number of referrals at last screening in 1978 for long-term eligible American Indian females by age and number of lifetime screenings.

	Number of Lifetime Screenings			
Age	1	2	3	4
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	2.000	-	-
7	-	.500	0	-
8	-	-	-	0
9	0	2.000	-	-
10	0	-	-	-
11	0	-	-	1.000
12	1.000	1.500	-	-
13	-	0	.500	-
14	-	1.000	2.000	1.000
15	-	.500	-	-
16	1.000	1.000	-	-
17	-	0	-	-
18	2.000	-	-	-
19	-	-	-	-
20	-	-	-	-
Grand Mean	.714	.857	.750	.750
% Change As No. Screenings Increase By One		+20%	-12%	0%

Table III(M). Average number of referrals at last screening in 1978 for long-term eligible Spanish-speaking males by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
1	-	-	-	-	-
2	-	-	-	-	-
3	-	-	-	-	-
4	-	-	0	-	-
5	-	0	-	-	-
6	1.000	1.142	.800	-	-
7	.333	1.142	.750	-	-
8	1.250	1.000	.900	0	1.500
9	0	1.833	.727	0	0
10	1.000	1.200	.833	-	-
11	.500	.250	.555	-	1.000
12	1.000	.800	.666	1.500	-
13	0	.800	1.200	1.000	-
14	1.000	.666	1.125	1.000	2.000
15	-	.400	1.500	-	-
16	-	.363	1.000	-	-
17	1.000	0	1.400	-	-
18	.500	.250	-	0	1.000
19	-	0	-	-	-
20	-	-	-	-	-
Grand Mean	.800	.755	.884	.714	1.166
% Change As No. Screenings Increase By One		-6%	+17%	-19%	+63%

Table III(N). Average number of referrals at last screening in 1978 for long-term eligible Spanish-speaking females by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
1	1.000	-	-	-	-
2	-	-	-	-	-
3	-	-	-	-	-
4	-	-	-	-	-
5	1.000	-	-	-	-
6	0	1.250	1.000	1.000	-
7	-	.750	1.166	.250	-
8	0	.875	.777	.500	-
9	1.500	1.000	0	0	-
10	0	.600	1.000	1.000	-
11	.666	.300	.333	1.000	1.000
12	1.000	.444	.500	.500	-
13	1.600	.800	.833	1.000	-
14	.500	.750	.777	0	-
15	-	1.333	0	1.000	-
16	2.000	1.000	1.000	-	-
17	-	1.500	0	1.000	-
18	-	.250	2.000	-	-
19	-	-	2.000	-	-
20	-	-	1.000	-	-
Grand Mean	.821	.834	.698	.650	1.000
% Change As No. Screenings Increase By One		+2%	-16%	-7%	+54%

Table III(O). Average number of referrals at last screening in 1978 for long-term eligible participants in Detroit by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
1	-	-	-	-	-
2	1.000	-	-	-	-
3	1.000	-	-	-	-
4	1.000	-	-	-	-
5	1.000	.333	.500	.500	2.000
6	1.277	.843	1.000	.600	0
7	1.042	1.285	.958	1.000	-
8	1.107	.945	1.000	.666	1.000
9	1.220	1.146	1.434	1.500	-
10	1.070	1.070	1.312	1.400	-
11	1.372	1.315	1.095	1.500	1.000
12	1.480	1.016	1.333	1.000	-
13	1.490	1.083	1.050	.333	-
14	1.462	1.072	1.500	1.000	1.000
15	1.375	1.083	1.333	-	1.000
16	1.444	1.128	1.733	1.000	-
17	1.454	1.442	1.214	-	1.000
18	1.760	1.200	1.166	2.000	-
19	1.363	1.785	-	-	-
20	1.214	1.333	1.333	-	-
Grand Mean	1.318	1.116	1.216	.980	1.000
% Change As No. Screenings Increased By One		-15%	+9%	-19%	+2%

Table III(P). Average number of referrals at last screening in 1978 for long-term eligible participants in forty-four Northern Michigan counties by number of lifetime screenings.

	Number of Lifetime Screenings				
	1	2	3	4	5
Mean	.817	.769	.789	.515	.882
% Change As No. Screenings Increase By One		-6%	+3%	-35%	+71%

APPENDIX D

Table III(a). Number of long-term eligibles screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
1	2	0	0	0	0	0	0	2
2	4	2	0	0	0	0	0	6
3	12	3	0	0	0	0	0	15
4	20	7	3	0	0	0	0	30
5	27	43	30	12	1	0	0	113
6	229	480	281	71	12	0	0	1143
7	149	313	269	75	5	0	0	811
8	217	495	398	73	9	0	0	1192
9	240	474	316	67	7	0	0	1104
10	226	495	263	53	5	0	1	1043
11	224	552	287	48	9	0	0	1120
12	312	558	303	62	6	0	0	1241
13	222	515	246	48	2	0	0	1033
14	260	529	252	38	2	0	0	1081
15	218	434	251	28	4	0	0	935
16	168	379	164	29	2	0	0	742
17	104	290	134	14	2	0	0	544
18	83	37	59	6	2	0	0	187
19	28	58	17	3	0	0	0	106
20	30	19	16	0	0	0	0	65
Total	2,845	5,683	3,289	627	68	0	1	12,513

Table III(Aa). Number of long-term eligible whites screened in 1978 by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	Total
1	1	0	0	0	0	1
2	3	1	0	0	0	4
3	1	3	0	0	0	4
4	9	6	1	0	0	16
5	18	28	15	1	0	62
6	138	193	115	38	7	491
7	54	132	126	34	3	349
8	95	219	181	38	5	538
9	121	238	168	45	4	576
10	90	234	133	31	3	491
11	110	255	128	23	6	522
12	160	273	149	34	3	619
13	120	232	109	18	2	481
14	126	212	105	22	1	466
15	123	193	112	12	3	443
16	84	167	70	15	1	337
17	52	113	39	6	0	210
18	25	37	15	1	0	78
19	12	16	6	0	0	34
20	3	2	2	0	0	7
Total	1,345	2,554	1,474	318	38	5,729

Table III(Ba). Number of long-term eligible blacks screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
1	0	0	0	0	0	0	0	0
2	1	1	0	0	0	0	0	2
3	11	0	0	0	0	0	0	11
4	11	1	1	0	0	0	0	13
5	8	14	15	11	1	0	0	49
6	154	268	151	32	5	0	0	610
7	92	164	130	36	2	0	0	424
8	115	261	196	31	2	0	0	605
9	113	221	130	20	2	0	0	486
10	128	243	122	19	2	0	1	515
11	105	281	144	22	1	0	0	553
12	146	260	140	23	3	0	0	572
13	94	261	123	27	0	0	0	505
14	127	288	128	12	0	0	0	555
15	95	218	126	15	1	0	0	455
16	82	191	87	14	1	0	0	375
17	51	165	88	7	2	0	0	313
18	55	99	43	4	1	0	0	202
19	16	41	9	3	0	0	0	69
20	27	17	13	0	0	0	0	57
Total	1,431	2,994	1,646	276	23	0	1	6,371

Table III(Ca). Number of long-term eligible American-Indians screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	Total
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	1	2	1	0	4
7	0	2	1	0	3
8	1	0	0	1	2
9	1	1	0	0	2
10	1	2	0	0	3
11	2	1	0	1	4
12	2	3	0	1	6
13	2	1	2	0	5
14	0	3	1	2	6
15	0	3	2	0	5
16	1	2	0	0	3
17	0	2	0	0	2
18	1	0	0	0	1
19	0	0	0	0	0
20	0	0	0	0	0
Total	12	22	7	5	46

Table III(Da). Number of long-term eligible Spanish-speaking screened in 1978 by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	Total
1	1	0	0	0	0	1
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	1	0	0	1
5	1	1	0	0	0	2
6	6	15	13	1	0	35
7	3	15	10	4	0	32
8	6	13	19	3	2	43
9	5	12	18	2	1	38
10	6	15	7	3	0	31
11	5	14	15	2	2	38
12	4	14	13	4	0	35
13	6	20	11	3	0	40
14	6	24	17	2	1	50
15	0	19	10	1	0	30
16	1	18	6	0	0	25
17	1	10	7	1	0	19
18	2	8	1	1	1	13
19	0	1	2	0	0	3
20	0	0	1	0	0	1
Total	53	199	151	27	7	437

Table III(Ea). Number of long-term eligible males screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
1	0	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	3
3	9	2	0	0	0	0	0	11
4	12	4	2	0	0	0	0	18
5	11	21	14	8	1	0	0	55
6	147	252	142	32	2	0	0	575
7	77	156	150	27	4	0	0	414
8	115	230	214	41	6	0	0	606
9	112	228	144	41	5	0	0	530
10	126	247	147	25	1	0	1	547
11	99	274	149	19	4	0	0	545
12	145	273	149	33	2	0	0	602
13	99	246	127	19	0	0	0	491
14	139	252	127	17	1	0	0	536
15	113	203	108	15	2	0	0	441
16	79	171	73	14	2	0	0	339
17	48	137	64	6	0	0	0	255
18	38	70	29	2	2	0	0	141
19	7	13	2	2	0	0	0	24
20	6	1	3	0	0	0	0	10
Total	1,385	2,780	1,644	301	32	0	1	6,143

Table III(Fa). Number of long-term eligible females screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	Total
1	2	0	0	0	0	2
2	1	2	0	0	0	3
3	3	1	0	0	0	4
4	8	3	1	0	0	12
5	16	22	16	4	0	58
6	152	228	139	39	10	568
7	72	157	119	48	1	397
8	102	265	184	32	3	586
9	128	246	172	26	2	574
10	100	248	116	28	4	496
11	125	278	138	29	5	575
12	167	285	154	29	4	639
13	123	269	119	29	2	542
14	121	277	125	21	1	545
15	105	231	143	13	2	494
16	89	208	91	15	0	403
17	56	153	70	8	2	289
18	45	75	30	4	0	154
19	21	45	15	1	0	82
20	24	18	13	0	0	55
Total	1,460	3,011	1,645	326	36	6,478

Table III(Ga). Number of long-term eligible white males screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	Total
1	0	0	0	0	0	0
2	2	0	0	0	0	2
3	1	2	0	0	0	3
4	6	3	1	0	0	10
5	7	12	8	1	0	28
6	67	99	54	20	1	241
7	28	68	81	18	3	198
8	54	100	98	20	3	275
9	60	127	82	29	3	301
10	55	121	73	17	0	266
11	43	131	69	9	3	255
12	71	136	82	17	1	307
13	58	105	50	9	0	222
14	69	100	50	9	0	228
15	67	86	48	7	2	210
16	38	76	32	9	1	156
17	28	55	18	3	0	104
18	7	22	8	1	0	38
19	4	4	1	0	0	9
20	2	1	0	0	0	3
Total	667	1,248	755	169	17	2,856

Table III(Ha). Number of long-term eligible white females screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	Total
1	1	0	0	0	0	1
2	1	1	0	0	0	2
3	0	1	0	0	0	1
4	3	3	0	0	0	6
5	11	16	7	0	0	34
6	71	94	61	18	6	250
7	26	64	45	16	0	151
8	41	119	83	18	2	263
9	61	111	86	16	1	275
10	35	113	60	14	3	225
11	67	124	59	14	3	267
12	89	137	67	17	2	312
13	62	127	59	9	2	259
14	57	112	55	13	1	238
15	56	107	64	5	1	233
16	46	91	38	6	0	181
17	24	58	21	3	0	106
18	18	15	7	0	0	40
19	8	12	5	0	0	25
20	1	1	2	0	0	4
Total	678	1,306	719	149	21	2,873

Table III(Ia). Number of long-term eligible black males screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
1	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	1
3	8	0	0	0	0	0	0	8
4	6	1	0	0	0	0	0	7
5	4	8	6	7	1	0	0	26
6	77	144	82	12	1	0	0	316
7	46	81	63	9	1	0	0	200
8	56	125	104	20	1	0	0	306
9	51	95	51	11	1	0	0	209
10	67	118	67	8	1	0	1	262
11	52	138	71	10	0	0	0	271
12	72	129	57	13	1	0	0	272
13	38	131	71	9	0	0	0	249
14	65	138	68	7	0	0	0	278
15	46	106	54	8	0	0	0	214
16	41	83	39	5	1	0	0	169
17	19	80	41	3	0	0	0	143
18	29	44	21	0	1	0	0	95
19	3	8	1	2	0	0	0	14
20	4	0	3	0	0	0	0	7
Total	685	1,429	799	124	9	0	1	3,047

Table III(Ja). Number of long-term eligible black females screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	Total
1	0	0	0	0	0	0
2	0	1	0	0	0	1
3	3	0	0	0	0	3
4	5	0	1	0	0	6
5	4	6	9	4	0	23
6	77	124	69	20	4	294
7	46	83	67	27	1	224
8	59	136	92	11	1	299
9	62	126	79	9	1	277
10	61	125	55	11	1	253
11	53	143	73	12	1	282
12	74	131	83	10	2	300
13	56	130	52	18	0	256
14	62	150	60	5	0	277
15	49	112	72	7	1	241
16	41	108	48	9	0	206
17	32	85	47	4	2	170
18	26	55	22	4	0	107
19	13	33	8	1	0	55
20	23	17	10	0	0	50
Total	746	1,565	847	152	14	3,324

Table III(Ka). Number of long-term eligible American Indian males screened in 1978 by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	Total
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	1	1	1	0	3
7	0	0	0	0	0
8	1	0	0	0	1
9	0	0	0	0	0
10	0	2	0	0	2
11	1	1	0	0	2
12	0	1	0	1	2
13	2	0	0	0	2
14	0	1	0	0	1
15	0	1	2	0	3
16	0	1	0	0	1
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0
20	0	0	0	0	0
Total	5	8	3	1	17

Table III(La). Number of long-term eligible American Indian females screened in 1978 by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	Total
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	1	0	0	1
7	0	2	1	0	3
8	0	0	0	1	1
9	1	1	0	0	2
10	1	0	0	0	1
11	1	0	0	1	2
12	2	2	0	0	4
13	0	1	2	0	3
14	0	2	1	2	5
15	0	2	0	0	2
16	1	1	0	0	2
17	0	2	0	0	2
18	1	0	0	0	1
19	0	0	0	0	0
20	0	0	0	0	0
Total	7	14	4	4	29

Table III(Ma). Number of long-term eligible Spanish-speaking males screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	Total
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	1	0	0	1
5	0	1	0	0	0	1
6	2	7	5	0	0	14
7	3	7	4	0	0	14
8	4	5	10	1	2	22
9	1	6	11	1	1	20
10	3	5	6	0	0	14
11	2	4	9	0	1	16
12	2	5	9	2	0	18
13	1	10	5	1	0	17
14	4	12	8	1	1	26
15	0	10	4	0	0	14
16	0	11	1	0	0	12
17	1	2	5	0	0	8
18	2	4	0	1	1	8
19	0	1	0	0	0	1
20	0	0	0	0	0	0
Total	25	90	78	7	6	206

Table III(Na). Number of long-term eligible Spanish-speaking females screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	Total
1	1	0	0	0	0	1
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	1	0	0	0	0	1
6	4	8	8	1	0	21
7	0	8	6	4	0	18
8	2	8	9	2	0	21
9	4	6	7	1	0	18
10	3	10	1	3	0	17
11	3	10	6	2	1	22
12	2	9	4	2	0	17
13	5	10	6	2	0	23
14	2	12	9	1	0	24
15	0	9	6	1	0	16
16	1	7	5	0	0	13
17	0	8	2	1	0	11
18	0	4	1	0	0	5
19	0	0	2	0	0	2
20	0	0	1	0	0	1
Total	28	109	73	20	1	231

Table III(0a). Number of long-term eligible participants screened in Detroit in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	Total
1	0	0	0	0	0	0
2	1	0	0	0	0	1
3	1	0	0	0	0	1
4	3	0	0	0	0	3
5	6	3	2	4	1	16
6	83	83	26	5	1	198
7	47	56	24	9	0	136
8	56	74	28	6	1	165
9	59	89	23	4	0	175
10	71	71	16	5	0	163
11	59	95	21	4	1	180
12	77	118	24	6	0	225
13	55	96	20	3	0	174
14	67	96	22	3	1	189
15	48	72	15	0	1	136
16	36	78	15	1	0	130
17	22	52	14	0	1	89
18	25	35	6	1	0	67
19	11	14	0	0	0	25
20	14	6	3	0	0	23
Total	741	1,038	259	51	7	2,096

Table III(Pa). Number of long-term eligible participants screened in 1978 in forty-four Northern Michigan counties by number of lifetime screenings.

Number of Lifetime Screenings					
1	2	3	4	5	Total
225	403	252	97	17	994

APPENDIX E

Table IV. Average number of referrals at last screening in 1978 for one-year eligibles by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	6	7
Under 1	0	-	-	-	-	-	-
1	.756	.755	1.000	-	-	-	-
2	.722	.619	.640	-	-	-	-
3	.771	.675	.555	1.285	2.000	-	-
4	.800	.826	.810	1.136	1.000	-	-
5	.982	.854	.798	.859	1.000	-	-
6	.991	.820	.822	.805	.947	2.000	-
7	1.029	.915	.864	.858	.866	-	-
8	.957	.876	.858	.661	1.235	-	-
9	.978	.867	.829	.740	.375	1.000	-
10	.973	.878	.884	.734	.714	-	1.000
11	.996	.872	.790	.905	.750	-	-
12	1.020	.872	.824	.847	.800	-	-
13	1.071	.892	.785	.594	.750	-	-
14	1.019	.881	.956	.833	1.500	-	-
15	1.098	.896	.930	.785	1.750	-	-
16	1.202	.941	1.007	.783	.666	-	-
17	1.175	1.013	1.010	1.150	1.000	-	-
18	1.347	1.000	.943	.666	.666	-	-
19	1.295	1.128	1.800	1.000	-	-	-
20	1.342	1.274	1.162	.500	-	-	-
Grand Mean	.933	.869	.859	.800	.923	1.500	1.000
% Change As No. Screenings Increased By One		-7%	-1%	-7%	+15%	+63%	-33%

Table IV(A). Average number of referrals at last screening in 1978 for one-year eligible whites by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	6
1	.716	.695	-	-	-	-
2	.657	.573	.608	-	-	-
3	.655	.628	.420	1.600	-	-
4	.789	.813	.680	.727	-	-
5	.988	.875	.786	.674	1.000	-
6	.955	.816	.743	.807	1.200	2.000
7	.974	.921	.925	.867	.888	-
8	.941	.879	.858	.647	1.230	-
9	.946	.805	.816	.742	.250	1.000
10	.883	.838	.825	.625	.800	-
11	.942	.793	.749	.658	.625	-
12	.918	.807	.750	.795	.714	-
13	.925	.905	.732	.531	.666	-
14	.948	.895	.901	.718	1.000	-
15	1.008	.870	.888	.521	2.000	-
16	1.053	.925	.984	.700	0	-
17	1.142	1.003	1.055	1.250	-	-
18	1.100	1.041	.933	.333	-	-
19	1.200	1.000	2.583	1.500	-	-
20	1.296	1.189	1.500	-	-	-
Grand Mean	.874	.844	.824	.731	.941	1.500
% Change As No. Screenings Increase By One		-3%	-2%	-11%	+29%	+60%

Table IV(B). Average number of referrals at last screening in 1978 for one-year eligible blacks by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
Under 1	0	-	-	-	-	-	-
1	.809	.791	1.000	-	-	-	-
2	.809	.698	.666	-	-	-	-
3	.940	.741	.743	.500	2.000	-	-
4	.829	.853	.955	1.700	1.000	-	-
5	.991	.825	.792	1.117	1.000	-	-
6	1.059	.833	.910	.744	.750	-	-
7	1.119	.912	.792	.920	.800	-	-
8	1.034	.871	.888	.738	1.000	-	-
9	1.051	.939	.903	.769	1.000	-	-
10	1.136	.945	.972	.923	.500	-	1.000
11	1.100	.997	.873	1.333	0	-	-
12	1.216	.987	.955	.892	1.000	-	-
13	1.294	.879	.842	.580	1.000	-	-
14	1.147	.886	1.006	1.055	-	-	-
15	1.235	.944	1.005	1.111	1.000	-	-
16	1.401	1.007	1.042	.933	1.000	-	-
17	1.231	1.016	.990	1.100	1.000	-	-
18	1.581	1.017	.928	1.000	.500	-	-
19	1.407	1.239	1.187	.750	-	-	-
20	1.386	1.277	1.076	1.000	-	-	-
Grand Mean	1.029	.912	.913	.923	.871	-	1.000
% Change As No. Screenings Increased By One		-11%	0%	+1%	-6%		+15%

Table IV(C). Average number of referrals at last screening in 1978 for one-year eligible American Indians by age and number of lifetime screenings.

Age	Number of Lifetime Screenings: 1	2	3	4
1	1.200	-	-	-
2	.166	.857	-	-
3	.833	.200	-	-
4	.875	1.000	2.500	-
5	1.000	.500	0	-
6	1.285	.857	1.666	2.000
7	.750	1.000	.500	-
8	0	1.400	.600	0
9	.888	1.833	0	2.000
10	1.200	.600	2.000	-
11	.333	.333	0	1.000
12	1.000	1.000	.500	1.333
13	1.500	.166	.666	3.000
14	1.000	.833	1.000	1.000
15	.666	.250	.500	-
16	1.000	.250	0	-
17	1.000	.333	-	-
18	2.000	1.000	-	-
19	1.000	2.000	-	-
20	-	-	1.000	-
Grand Mean	.910	.741	.833	1.416
% Change As No. Screenings Increase By One		-19%	+12%	+70%

Table IV(D). Average number of referrals at last screening in 1978 for one-year eligible Spanish-speaking by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5
1	.577	1.000	-	-	-
2	.658	.315	-	-	-
3	.956	.789	0	-	-
4	.629	.704	.571	0	-
5	.609	.900	1.125	0	-
6	.947	.711	.740	.888	0
7	.960	.820	.785	.500	1.000
8	.628	.840	.724	.428	1.500
9	.789	1.000	.535	.428	0
10	.827	.723	.625	.800	-
11	.925	.714	.615	.500	1.333
12	.727	.760	.562	.800	-
13	.931	.800	.789	.600	-
14	.827	.733	1.000	.500	2.000
15	1.384	.842	.529	1.000	-
16	1.727	.588	1.000	.500	-
17	1.000	1.090	.909	1.000	-
18	.833	.500	1.500	.500	1.000
19	2.000	.714	2.000	-	-
20	1.272	2.666	1.000	-	-
Grand Mean	.816	.780	.752	.606	1.000
% Change As No. Screenings Increase By One		-4%	-4%	-19%	+65%

Table IV(E). Average number of referrals at last screening in 1978 for one-year eligible males by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
1	.729	.966	1.000	-	-	-	-
2	.722	.596	.708	-	-	-	-
3	.780	.688	.428	.400	2.000	-	-
4	.821	.891	.818	1.416	-	-	-
5	1.035	.892	.799	.976	1.250	-	-
6	1.043	.895	.807	.714	1.500	-	-
7	1.040	.970	.829	.963	1.000	-	-
8	.975	.826	.842	.703	1.384	-	-
9	.967	.912	.856	.716	.333	1.000	-
10	.968	.901	.876	.636	1.000	-	1.000
11	.977	.887	.727	.685	.750	-	-
12	1.094	.890	.803	.934	0	-	-
13	1.000	.863	.791	.642	1.000	-	-
14	.969	.836	.950	.619	2.000	-	-
15	1.015	.835	.827	1.142	1.500	-	-
16	1.218	.957	.916	.562	.666	-	-
17	1.095	1.027	.926	1.000	-	-	-
18	1.282	.967	.809	.333	.666	-	-
19	1.250	.928	3.000	1.000	-	-	-
20	1.75	1.333	1.000	-	-	-	-
Grand Mean	.922	.877	.828	.792	1.035	1.000	1.000
% Change As No. Screenings Increased By One		-5%	-6%	-4%	+31%	-3%	0%

Table IV(F). Average number of referrals at last screening in 1978 for one-year eligible females by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	6
Under 1	0	-	-	-	-	-
1	.783	.421	-	-	-	-
2	.722	.642	.576	-	-	-
3	.763	.662	.666	3.500	-	-
4	.777	.764	.801	.800	1.000	-
5	.930	.814	.797	.714	.800	-
6	.938	.741	.837	.901	.692	2.000
7	1.019	.862	.899	.780	.714	-
8	.938	.925	.875	.611	.750	-
9	.990	.826	.804	.772	.500	-
10	.979	.857	.893	.857	.600	-
11	1.014	.855	.851	1.102	.750	-
12	.953	.855	.843	.743	1.142	-
13	1.136	.917	.778	.561	.666	-
14	1.073	.927	.963	.969	1.000	-
15	1.184	.948	1.014	.428	2.000	-
16	1.188	.927	1.082	.952	-	-
17	1.244	1.000	1.094	1.272	1.000	-
18	1.381	1.024	1.065	.833	-	-
19	1.300	1.171	1.714	1.000	-	-
20	1.327	1.272	1.176	.500	-	-
Grand Mean	.944	.861	.888	.809	.819	2.000
% Chnage As No. Screenings Increase By One		-9%	+3%	-9%	+1%	+144%

Table IV(G). Average number of referrals at last screening in 1978 for one-year eligible white males by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	6
1	.658	1.000	-	-	-	-
2	.666	.556	.583	-	-	-
3	.674	.601	.280	.333	-	-
4	.807	.876	.750	1.200	-	-
5	1.004	.898	.785	.777	0	-
6	.990	.916	.681	.744	2.333	-
7	.996	1.000	.866	.885	1.000	-
8	.975	.881	.922	.769	1.400	-
9	.986	.869	.849	.714	.333	1.000
10	.922	.893	.833	.533	1.000	-
11	.949	.842	.642	.619	.666	-
12	.992	.837	.753	.963	0	-
13	.836	.864	.688	.705	-	-
14	.905	.852	.942	.538	-	-
15	.955	.870	.759	.750	1.500	-
16	1.080	.994	.916	.500	0	-
17	1.088	.984	.885	1.000	-	-
18	1.028	1.255	.933	.500	-	-
19	1.285	1.111	2.000	1.000	-	-
20	1.500	2.000	-	-	-	-
Grand Mean	.873	.875	.794	.739	1.029	1.000
% Change As No. Screenings Increase By One		0%	-9%	-7%	+39%	-3%

Table IV(H). Average number of referrals at last screening in 1978 for one-year eligible white females by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	6
1	.783	.363	-	-	-	-
2	.647	.592	.636	-	-	-
3	.637	.654	.560	3.500	-	-
4	.771	.748	.596	.333	-	-
5	.972	.849	.787	.600	2.000	-
6	.922	.709	.806	.875	.714	2.000
7	.952	.846	.993	.848	.500	-
8	.900	.876	.790	.482	.666	-
9	.904	.747	.789	.785	0	-
10	.839	.787	.818	.777	.750	-
11	.936	.735	.854	.700	.600	-
12	.850	.779	.746	.590	1.000	-
13	1.004	.936	.771	.333	.666	-
14	.995	.937	.863	.842	1.000	-
15	1.069	.870	.990	.272	3.000	-
16	1.028	.855	1.042	.900	-	-
17	1.198	1.023	1.216	1.500	-	-
18	1.133	.870	.933	0	-	-
19	1.189	.977	2.636	2.000	-	-
20	1.287	1.166	1.500	-	-	-
Grand Mean	.876	.814	.853	.721	.852	2.000
% Change As No. Screenings Increase By One		-7%	+5%	-15%	+18%	+135%

Table IV(I). Average number of referrals at last screening in 1978 for one-year eligible black males by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	7
1	.851	.937	1.000	-	-	-	-
2	.792	.669	.833	-	-	-	-
3	.919	.798	.647	.500	2.000	-	-
4	.867	.947	.902	1.833	-	-	-
5	1.147	.872	.766	1.166	2.500	-	-
6	1.140	.880	.977	.636	1.000	-	-
7	1.132	.925	.804	1.250	1.000	-	-
8	1.017	.744	.770	.652	1.000	-	-
9	.958	.959	.904	.800	1.000	-	-
10	1.064	.900	.936	.846	1.00	-	1.000
11	1.049	.954	.838	.833	-	-	-
12	1.310	.976	.909	.933	0	-	-
13	1.260	.868	.892	.500	1.000	-	-
14	1.102	.832	.913	.714	-	-	-
15	1.117	.821	.884	1.666	-	-	-
16	1.406	1.007	.943	.600	1.000	-	-
17	1.055	1.043	.905	1.000	-	-	-
18	1.480	.849	.740	-	.500	-	-
19	1.166	.875	4.000	1.000	-	-	-
20	2.000	1.000	1.000	-	-	-	-
Grand Mean	1.013	.889	.873	.9191	1.133	-	1.000
% Change As No. Screenings Increased By One		-12%	-2%	+5%	+23%		-12%

Table IV(J). Average number of referrals at last screening in 1978 for one-year eligible black females by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
Under 1	0	-	-	-	-
1	.769	.500	-	-	-
2	.827	.726	.533	-	-
3	.963	.681	.818	-	-
4	.788	.768	1.000	1.500	1.000
5	.860	.778	.816	1.000	0
6	.967	.783	.830	.840	.666
7	1.109	.898	.782	.764	.750
8	1.050	.991	1.014	.842	1.000
9	1.138	.992	.902	.727	1.000
10	1.217	.990	1.011	1.000	0
11	1.145	1.041	.904	1.733	0
12	1.132	1.000	.990	.846	1.500
13	1.325	.891	.777	.619	-
14	1.197	.941	1.097	1.272	-
15	1.349	1.052	1.106	.555	1.000
16	1.396	1.006	1.123	1.100	-
17	1.350	.992	1.074	1.200	1.000
18	1.640	1.144	1.103	1.000	-
19	1.426	1.315	1.000	.500	-
20	1.363	1.285	1.087	1.000	-
Grand Mean	1.045	.932	.950	.927	.708
% Change As No. Screenings Increase By One		-11%	+2%	-2%	-24%

Table IV(K). Average number of referrals at last screening in 1978 for one-year eligible American Indian males by age and number of lifetime screenings.

	Number of Lifetime Screenings			
Age	1	2	3	4
1	0	-	-	-
2	.500	1.000	-	-
3	.666	0	-	-
4	.714	0	2.500	-
5	1.500	.500	0	-
6	1.200	.333	1.500	-
7	.571	0	.500	-
8	0	1.500	.333	-
9	1.333	1.666	0	-
10	1.000	.666	2.000	-
11	.500	.400	0	1.000
12	1.000	.666	1.000	0
13	1.333	.333	1.000	-
14	0	.750	0	-
15	.500	0	.500	-
16	-	0	0	-
17	-	1.000	-	-
18	-	1.000	-	-
19	-	-	-	-
20	-	-	-	-
Grand Mean	.775	.619	.708	.500
% Change As No. Screenings Increase By One		-20%	+14%	-29%

Table IV(L). Average number of referrals at last screening in 1978 for one-year eligible American Indian females by age and number of lifetime screenings.

	Number of Lifetime Screenings			
Age	1	2	3	4
1	2.000	-	-	-
2	0	.800	-	-
3	1.333	.250	-	-
4	2.000	2.000	2.500	-
5	.750	.500	0	-
6	1.500	1.250	2.000	2.000
7	2.000	1.000	.500	-
8	-	1.333	1.000	0
9	.666	2.000	-	2.000
10	1.333	.500	2.000	-
11	0	0	0	1.000
12	1.000	1.500	0	2.000
13	2.000	0	.500	3.000
14	1.333	1.000	1.500	1.000
15	1.000	.333	-	-
16	1.000	.500	-	-
17	1.000	0	-	-
18	2.000	-	-	-
19	1.000	2.000	-	-
20	-	-	1.000	-
Grand Mean	1.075	.851	1.000	1.600
% Change As No. Screenings Increase By One		-21%	+18%	+60%

Table IV(M). Average number of referrals at last screening in 1978 for one-year eligible Spanish-speaking males by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5
1	.333	1.000	-	-	-
2	.700	.416	-	-	-
3	1.087	.875	-	-	-
4	.516	.550	.600	0	-
5	.640	1.105	1.666	0	-
6	.900	.636	.571	.800	0
7	.941	.944	.600	.333	-
8	.842	.666	.812	0	1.500
9	.642	1.000	.750	.333	0
10	.857	.700	.727	1.000	-
11	.833	.958	.785	0	1.000
12	.750	.818	.600	1.000	-
13	.692	.666	.777	1.000	-
14	.642	.708	1.272	1.000	2.000
15	3.000	.611	1.000	-	-
16	1.500	.300	.750	1.000	-
17	1.000	1.250	1.285	-	-
18	1.000	.400	-	0	1.000
19	-	.500	-	-	-
20	-	-	-	-	-
Grand Mean	.763	.741	.829	.541	.875
% Change As No. Screenings Increase By One		-3%	+12%	-35%	+62%

Table IV(N). Average number of referrals at last screening in 1978 for one-year eligible Spanish-speaking females by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
1	.791	-	-	-	-
2	.619	.142	-	-	-
3	.826	.727	0	-	-
4	.741	.833	.500	-	-
5	.562	.714	.800	-	-
6	1.000	.766	.923	1.000	-
7	1.000	.714	.888	.600	1.000
8	.375	1.000	.615	.600	-
9	.875	1.000	.250	.500	-
10	.800	.740	.400	.750	-
11	1.000	.388	.416	.666	1.500
12	.714	.714	.500	.500	-
13	1.125	.952	.800	.500	-
14	1.000	.761	.727	0	-
15	1.090	1.050	0	1.000	-
16	1.857	1.000	1.090	0	-
17	1.000	1.000	.250	1.000	-
18	.714	.555	1.500	1.000	-
19	2.000	.800	2.000	-	-
20	1.272	2.666	1.000	-	-
Grand Mean	.862	.815	.673	.648	1.333
% Change As No. Screenings Increase By One		-5%	-17%	-4%	+106%

Table IV(O). Average number of referrals at last screening in 1978 for one-year participants in Detroit by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	5
Under 1	0	-	-	-	-
1	.689	.750	-	-	-
2	.821	1.067	1.116	-	-
3	.828	.738	.615	.500	2.000
4	.784	.851	1.166	2.250	1.000
5	.912	.784	1.000	.666	1.250
6	1.142	.800	1.051	.875	1.000
7	1.025	1.040	1.057	1.181	-
8	1.103	.943	1.219	.714	1.000
9	1.168	1.072	1.285	1.800	-
10	1.083	1.043	1.458	1.833	-
11	1.216	1.303	1.071	1.500	1.500
12	1.383	1.090	1.266	1.000	-
13	1.427	1.125	1.000	.750	-
14	1.323	1.057	1.320	1.250	1.000
15	1.344	1.083	1.291	-	1.000
16	1.593	1.221	1.526	1.000	-
17	1.469	1.437	1.294	-	1.000
18	1.569	1.093	1.428	2.000	-
19	1.513	1.571	-	0	-
20	1.397	1.291	1.333	-	-
Grand Mean	1.057	1.052	1.186	1.150	1.214
% Change As No. Screenings Increase By One		0%	+13%	-3%	+6%

Table IV(P). Average number of referrals at last screening in 1978 for one-year eligible participants in forty-four Northern Michigan counties by number of lifetime screenings.

	Number of Lifetime Screenings				
	1	2	3	4	5
Mean	.768	.788	.761	.652	.812
% Change As No. Screenings Increase By One		+3%	-3%	-14%	+25%

APPENDIX F

Table IV(a). Number of one-year eligibles screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
Under 1	1	0	0	0	0	0	0	1
1	1250	49	1	0	0	0	0	1300
2	2617	496	50	0	0	0	0	3163
3	1718	588	90	7	1	0	0	2404
4	1770	1108	232	22	1	0	0	3133
5	1387	1197	426	78	9	0	0	3097
6	1381	1291	601	141	19	1	0	3434
7	904	878	545	127	15	0	0	2469
8	1032	1160	672	118	17	0	0	2999
9	991	1128	550	104	8	1	0	2782
10	903	1063	450	79	7	0	1	2503
11	826	1075	473	74	12	0	0	2460
12	940	1094	456	85	10	0	0	2585
13	701	968	387	69	4	0	0	2129
14	764	939	371	54	2	0	0	2130
15	642	800	372	42	4	0	0	1860
16	493	687	266	37	3	0	0	1486
17	359	532	190	20	3	0	0	1104
18	265	284	88	9	3	0	0	649
19	220	156	30	6	0	0	0	412
20	333	113	37	2	0	0	0	485
Total	19,497	15,606	6,287	1,074	118	2	1	42,585

Table IV(Aa). Number of one-year eligible whites screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	Total
1	610	23	0	0	0	0	633
2	1381	258	23	0	0	0	1662
3	1013	323	50	5	0	0	1391
4	1019	574	125	11	0	0	1729
5	881	737	239	43	4	0	1904
6	859	737	323	83	10	1	2013
7	551	512	310	68	9	0	1450
8	612	662	347	68	13	0	1702
9	584	659	322	70	4	1	1640
10	540	601	247	48	5	0	1441
11	487	585	247	41	8	0	1368
12	563	614	256	49	7	0	1489
13	405	529	198	32	3	0	1167
14	445	469	182	32	1	0	1129
15	373	433	180	23	3	0	1012
16	279	360	130	20	1	0	790
17	203	256	72	8	0	0	539
18	110	97	30	3	0	0	240
19	125	54	12	2	0	0	193
20	152	37	8	0	0	0	197
Total	11,192	8,520	3,301	606	68	2	23,689

Table IV(Ba). Number of one-year eligible blacks screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
Under 1	1	0	0	0	0	0	0	1
1	584	24	1	0	0	0	0	609
2	1125	209	27	0	0	0	0	1361
3	633	240	39	2	1	0	0	915
4	668	485	89	10	1	0	0	1253
5	446	407	164	34	5	0	0	1056
6	468	491	245	47	8	0	0	1259
7	317	319	199	50	5	0	0	889
8	374	445	286	42	2	0	0	1149
9	351	414	197	26	2	0	0	990
10	323	404	182	26	2	0	1	938
11	299	437	198	27	1	0	0	962
12	332	411	181	28	3	0	0	955
13	255	383	165	31	1	0	0	835
14	279	414	163	18	0	0	0	874
15	242	323	172	18	1	0	0	756
16	197	286	118	15	2	0	0	618
17	134	249	107	10	3	0	0	503
18	141	170	56	4	2	0	0	373
19	81	92	16	4	0	0	0	193
20	163	72	26	1	0	0	0	262
Total	7,413	6,275	2,630	393	39	0	1	16,751

Table IV(Ca). Number of one-year eligible American Indians screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	Total
1	5	0	0	0	5
2	6	7	0	0	13
3	12	5	0	0	17
4	8	4	4	0	16
5	6	10	4	0	20
6	7	7	3	2	19
7	8	4	6	0	18
8	1	5	5	1	12
9	9	6	2	1	18
10	5	5	3	0	13
11	3	6	2	2	13
12	3	5	2	3	13
13	4	6	3	1	14
14	4	6	3	2	15
15	3	4	2	0	9
16	1	4	2	0	7
17	1	3	0	0	4
18	1	1	0	0	2
19	2	1	0	0	3
20	0	0	1	0	1
Total	89	89	42	12	232

Table IV(Da). Number of one-year eligible Spanish-speaking screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	Total
1	45	2	0	0	0	47
2	82	19	0	0	0	101
3	46	19	1	0	0	66
4	62	44	14	1	0	121
5	41	40	16	1	0	98
6	38	52	27	9	1	127
7	25	39	28	8	1	101
8	35	44	29	7	2	117
9	38	45	28	7	2	120
10	29	47	16	5	0	97
11	27	42	26	4	3	102
12	33	50	16	5	0	104
13	29	45	19	5	0	98
14	29	45	22	2	1	99
15	13	38	17	1	0	69
16	11	34	15	2	0	62
17	14	22	11	2	0	49
18	12	14	2	2	1	31
19	6	7	2	0	0	15
20	11	3	2	0	0	16
Total	626	651	291	61	11	1,640

Table IV(Ea). Number of one-year eligible males screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings							
Age	1	2	3	4	5	6	7	Total
1	644	30	1	0	0	0	0	675
2	1361	253	24	0	0	0	0	1638
3	874	292	42	5	1	0	0	1214
4	898	544	121	12	0	0	0	1575
5	678	614	199	43	4	0	0	1538
6	696	660	312	70	6	0	0	1744
7	443	433	276	54	8	0	0	1214
8	530	569	350	64	13	0	0	1526
9	493	535	258	60	6	1	0	1353
10	475	517	235	44	2	0	1	1274
11	396	569	231	35	4	0	0	1235
12	443	541	219	46	3	0	0	1252
13	335	447	197	28	1	0	0	1008
14	397	470	181	21	1	0	0	1070
15	327	371	168	21	2	0	0	889
16	238	330	120	16	3	0	0	707
17	167	254	95	9	0	0	0	525
18	92	123	42	3	3	0	0	263
19	20	28	2	3	0	0	0	53
20	12	3	3	0	0	0	0	18
Total	9,519	7,583	3,076	534	57	1	1	20,771

Table IV(Fa). Number of one-year eligible females screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	Total
Under 1	1	0	0	0	0	0	1
1	606	19	0	0	0	0	625
2	1256	243	26	0	0	0	1525
3	844	296	48	2	0	0	1190
4	872	564	111	10	1	0	1558
5	709	583	227	35	5	0	1559
6	685	631	289	71	13	1	1690
7	461	445	269	73	7	0	1255
8	502	591	322	54	4	0	1473
9	498	593	292	44	2	0	1429
10	428	546	215	35	5	0	1229
11	430	506	242	39	8	0	1225
12	497	553	237	39	7	0	1333
13	366	521	190	41	3	0	1121
14	367	469	190	33	1	0	1060
15	315	429	204	21	2	0	971
16	255	357	146	21	0	0	779
17	192	278	95	11	3	0	579
18	173	161	46	6	0	0	386
19	200	128	28	3	0	0	359
20	321	110	34	2	0	0	467
Total	9,978	8,023	3,211	540	61	1	21,814

Table IV(Ga). Number of one-year eligible white males screened in 1978 by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	6	Total
1	328	12	0	0	0	0	340
2	738	133	12	0	0	0	883
3	500	158	25	3	0	0	686
4	503	292	68	5	0	0	868
5	444	385	112	18	2	0	961
6	418	382	163	43	3	0	1009
7	275	252	165	35	7	0	734
8	331	329	180	39	10	0	889
9	302	315	146	42	3	1	809
10	285	290	126	30	1	0	732
11	237	317	123	21	3	0	701
12	268	301	130	27	2	0	728
13	190	228	93	17	0	0	528
14	232	231	87	13	0	0	563
15	200	201	79	12	2	0	494
16	136	180	60	10	1	0	387
17	102	127	35	4	0	0	268
18	35	43	15	2	0	0	95
19	14	9	1	1	0	0	25
20	6	1	0	0	0	0	7
Total	5,544	4,186	1,620	322	34	1	11,707

Table IV(Ha). Number of one-year eligible white females screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings						
Age	1	2	3	4	5	6	Total
1	282	11	0	0	0	0	293
2	643	125	11	0	0	0	779
3	513	165	25	2	0	0	705
4	516	282	57	6	0	0	861
5	437	352	127	25	2	0	943
6	441	355	160	40	7	1	1004
7	276	260	145	33	2	0	716
8	281	333	167	29	3	0	813
9	282	344	176	28	1	0	831
10	255	311	121	18	4	0	709
11	250	268	124	20	5	0	667
12	295	313	126	22	5	0	761
13	215	301	105	15	3	0	639
14	213	238	95	19	1	0	566
15	173	232	101	11	1	0	518
16	143	180	70	10	0	0	403
17	101	129	37	4	0	0	271
18	75	54	15	1	0	0	145
19	111	45	11	1	0	0	168
20	146	36	8	0	0	0	190
Total	5,648	4,334	1,681	284	34	1	11,982

Table IV(Ia). Number of one-year eligible black males screened in 1978 by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	5	6	7	Total
1	289	16	1	0	0	0	0	306
2	568	103	12	0	0	0	0	683
3	334	124	17	2	1	0	0	478
4	347	230	41	6	0	0	0	624
5	203	204	77	24	2	0	0	510
6	250	251	133	22	1	0	0	657
7	143	161	97	16	1	0	0	419
8	174	215	148	23	1	0	0	561
9	170	196	94	15	1	0	0	476
10	171	200	94	13	1	0	1	479
11	141	221	93	12	0	0	0	467
12	158	211	77	15	1	0	0	462
13	123	190	93	10	1	0	0	417
14	147	209	81	7	0	0	0	444
15	119	151	78	9	0	0	0	357
16	96	127	53	5	2	0	0	283
17	54	116	53	5	0	0	0	228
18	52	73	27	0	2	0	0	154
19	6	16	1	2	0	0	0	25
20	6	2	3	0	0	0	0	11
Total	3,551	3,016	1,273	186	14	0	1	8,041

Table IV(Ja). Number of one-year eligible black females screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	Total
Under 1	1	0	0	0	0	1
1	295	8	0	0	0	303
2	557	106	15	0	0	678
3	299	116	22	0	0	437
4	321	255	48	4	1	629
5	243	203	87	10	3	546
6	218	240	112	25	6	601
7	174	158	101	34	4	471
8	200	230	138	19	1	588
9	181	218	103	11	1	514
10	152	204	88	13	1	458
11	158	216	105	15	1	495
12	174	200	104	13	2	493
13	132	193	72	21	0	418
14	132	205	82	11	0	430
15	123	172	94	9	1	399
16	101	159	65	10	0	335
17	80	133	54	5	3	275
18	89	97	29	4	0	219
19	75	76	15	2	0	168
20	157	70	23	1	0	251
Total	3,862	3,259	1,357	207	24	8,709

Table IV(Ka). Number of one-year eligible American Indian males screened in 1978 by age and number of lifetime screenings.

Age	Number of Lifetime Screenings 1	2	3	4	Total
1	2	0	0	0	2
2	2	2	0	0	4
3	9	1	0	0	10
4	7	2	2	0	11
5	2	6	3	0	11
6	5	3	2	0	10
7	7	0	2	0	9
8	1	2	3	0	6
9	3	3	2	0	8
10	2	3	2	0	7
11	2	5	1	1	9
12	1	3	1	1	6
13	3	3	1	0	7
14	1	4	1	0	6
15	2	1	2	0	5
16	0	2	2	0	4
17	0	1	0	0	1
18	0	1	0	0	1
19	0	0	0	0	0
20	0	0	0	0	0
Total	49	42	24	2	117

Table IV(La). Number of one-year eligible American Indian females screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings				
Age	1	2	3	4	Total
1	3	0	0	0	3
2	4	5	0	0	9
3	3	4	0	0	7
4	1	2	2	0	5
5	4	4	1	0	9
6	2	4	1	2	9
7	1	4	4	0	9
8	0	3	2	1	6
9	6	3	0	1	10
10	3	2	1	0	6
11	1	1	1	1	4
12	2	2	1	2	7
13	1	3	2	1	7
14	3	2	2	2	9
15	1	3	0	0	4
16	1	2	0	0	3
17	1	2	0	0	3
18	1	0	0	0	1
19	2	1	0	0	3
20	0	0	1	0	1
Total	40	47	18	10	115

Table IV(Ma). Number of one-year eligible Spanish-speaking males screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	Total
1	21	2	0	0	0	23
2	40	12	0	0	0	52
3	23	8	0	0	0	31
4	31	20	10	1	0	62
5	25	19	6	1	0	51
6	20	22	14	5	1	62
7	17	18	10	3	0	48
8	19	21	16	2	2	60
9	14	21	16	3	2	56
10	14	20	11	1	0	46
11	12	24	14	1	1	52
12	12	22	10	3	0	47
13	13	24	9	1	0	47
14	14	24	11	1	2	52
15	2	18	9	0	0	29
16	4	20	4	1	0	29
17	6	8	7	0	0	21
18	5	5	0	1	1	12
19	0	2	0	0	0	2
20	0	0	0	0	0	0
Total	292	310	147	24	9	782

Table IV(Na). Number of one-year eligible Spanish-speaking females screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	Total
1	24	0	0	0	0	24
2	42	7	0	0	0	49
3	23	11	1	0	0	35
4	31	24	4	0	0	59
5	16	21	10	0	0	47
6	18	30	13	4	0	65
7	8	21	18	5	1	53
8	16	23	13	5	0	57
9	24	24	12	4	0	64
10	15	27	5	4	0	51
11	15	18	12	3	2	50
12	21	28	6	2	0	57
13	16	21	10	4	0	51
14	15	21	11	1	0	48
15	11	20	8	1	0	40
16	7	14	11	1	0	33
17	8	14	4	2	0	28
18	7	9	2	1	0	19
19	6	5	2	0	0	13
20	11	3	2	0	0	16
Total	334	341	144	37	3	859

Table IV(0a). Number of one-year eligible participants in Detroit screened in 1978 by age and number of lifetime screenings.

	Number of Lifetime Screenings					
Age	1	2	3	4	5	Total
Under 1	1	0	0	0	0	1
1	264	12	0	0	0	276
2	531	59	6	0	0	596
3	262	84	13	2	1	362
4	357	128	18	4	1	508
5	216	93	22	9	4	344
6	266	150	39	8	2	465
7	155	99	35	11	0	300
8	194	124	41	7	1	367
9	190	151	35	5	0	381
10	179	115	24	6	0	324
11	157	145	28	4	2	336
12	185	166	30	6	0	387
13	131	135	26	4	0	296
14	142	140	25	4	1	312
15	125	108	24	0	1	258
16	86	113	19	1	0	219
17	66	80	17	0	1	164
18	65	64	7	1	0	137
19	37	28	0	1	0	66
20	83	24	3	0	0	110
Total	3,692	2,018	412	73	14	6,209

Table IV(Pa). Number of one-year eligible participants screened in 1978 in forty-four Northern Michigan counties by number of lifetime screenings.

Number of Lifetime Screenings					
1	2	3	4	5	Total
1,854	1,562	671	164	32	4,283

APPENDIX G

Table XVII. Summary of the analysis of covariance for long-term eligibles.

Source	Sums of Squares	DF	F
1. SS due to interaction model	$R^2_{\text{Interaction}} = .05032$	13	$\frac{(1)/DF_1}{(4)/DF_4} = 45.63$*
2. SS due to additive model	$R^2_{\text{Additive}} = .04978$	7	$\frac{(2)/DF_2}{(4)/DF_4} = 83.83$*
(a) SS due to screening year adjusted for no. of screenings	$R^2_{\text{Add.}} - R^2$ No. Screens = .0497 - .0270	1	$\frac{(2a)/DF_{2a}}{(4)/DF_4} = 268.27$*
(b) SS due to no. screens adjusted for screen. yr.	$R^2_{\text{Add.}} - R^2_{\text{Screen Yr.}}$ = .0497 = .0467	6	$\frac{(2_b)/DF_{2b}}{(4)/DF_4} = 5.93$*
3. SS due to interaction	$R^2_{\text{Inter.}} - R^2_{\text{Add.}} = .05032 - .04978$	6	$\frac{(3)/DF_3}{(4)/DF_4} = 1.06$
4. SS Residual	$1-R^2_{\text{Inter.}} = .9496$	11,196	

*Statistically significant at the .05 level

Calculations for Table XVII tests:

1. For interaction (#3 in table):

$$\frac{.00054/.94968}{6/11,196} =$$

$$.00009/.0000848 =$$

1.0613 = not significant give ${}_{.95}F_{6,11196} = 2.10$

2. For main effects of screening year with number of past screenings adjusted (2a in table):

$$\frac{.04978 - .02703}{1}/\frac{1 - .0503}{11,196} =$$

$$\frac{.02275}{1}/\frac{.9497}{11,196} =$$

.02275/.0000848 = 268.278, significant given ${}_{.95}F_{1,11196} = 3.84$

3. For main effects of lifetime screenings with screening year adjusted (2b in table):

$$\frac{.05978 - .04676}{6} / \frac{.94968}{11,196} =$$

$$\frac{.00302}{6} / .0000848 =$$

.0005033/.0000848 = 5.935 significant given ${}_{.95}F_{6,11196} = 2.10$

APPENDIX H

The full, or saturated, regression model which includes both independent variables and their interaction is as follows:

$$Y' = \text{Predicted No. of Referrals} = A + B_1D_1 + B_2D_2 + B_3D_3 + \ldots + B_6D_6 + B_7\text{NumScren} + B_8D_1N + B_9D_2N + B_{10}D_3N + \ldots B_{13}D_6N + E_i,$$

where: D_1 = 1 if last screened in 1973,
0 otherwise;

D_2 = 1 if last screened in 1974,
0 otherwise;

D_3 = 1 if last screened in 1975,
0 otherwise;

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D_6 = 1 if last screened in 1978,
0 otherwise.

and

B_0 = Intercept for 1979, B_7 = Slope for 1979,

B_1 = Intercept for 1973, B_8 = Slope for 1974,

B_2 = Intercept for 1974, B_9 = Slope for 1974,

B_3 = Intercept for 1975, B_{10} = Slope for 1975

. .

. .

.   .

B_6 = Intercept for 1978; B_{13} = Slope for 1978;

and

$D_1N = D_1 \times$ NumScren   NumScren = Number of lifetime Screenings.

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$D_6N = D_6 \times$ NumScren   1979 = the "base" year in the model, a determination which is arbitrary and has no effect on outcome.

The regression lines for each year are as follows per the interaction model:

For 1979, NR = A + B_7NumScren

= .9151 - .0664 NumScren

For 1978, NR = (A + B_6) + (B_7 + B_{13}) NumScren

= (.9151 + .1431) + (-.0664 + -.0059) NumScren

= 1.0582 + (-.0723) NumScren

For 1977, NR = (A + B_5) + (B_7 + B_{12}) NumScren

= (.9151 + .2477) + (-.0664 + - .0372) NumScren

= 1.1628 + (- .1036) NumScren

For 1976, $NR = (A + B_4) + (B_7 + B_{11})$ NumScren

$= (.9151 + .2556) + (-\ .0664 + -.0544)$ NumScren

$= 1.1707 + (-.1208)$ NumScren

For 1975, $NR = (A + B_3) + (B_7 + B_{10})$ NumScren

$= (.9151 + .4313) + (-.0664 + -.0558)$ NumScren

$= (1.3464) + (-.1222)$ NumScren

For 1974, $NR = (A + B_2) + (B_7 + B_9)$ NumScren

$= (.9151 + .8960) + (-.0664 + -\ .2993)$ NumScren

$= 1.8111 + (-.3657)$ NumScren

For 1973, $NR = (A + B_1) + (B_7 + B_8)$ NumScren

$= (.9151 + .4744) + (-.0664 + .2049)$ NumScren

$= 1.3895 + (.1385)$ NumScren

The graph of the regression line for each year is on the following page. What is most noticeable in these lines is the fairly similar and flat slopes for 1975-1979 (which caused the interactive model to be not significant), the stronger inverse relationship for 1974 and the positive slope for 1973. The latter's deviation from the inverse relationship is understandable. 1973 was the first year of the program and only several dozen children were screened more than once. In the sample, only six rescreenings were selected and these had a higher mean than did the initial screenings. Thus, the regression line had no alternative to a positive slope.

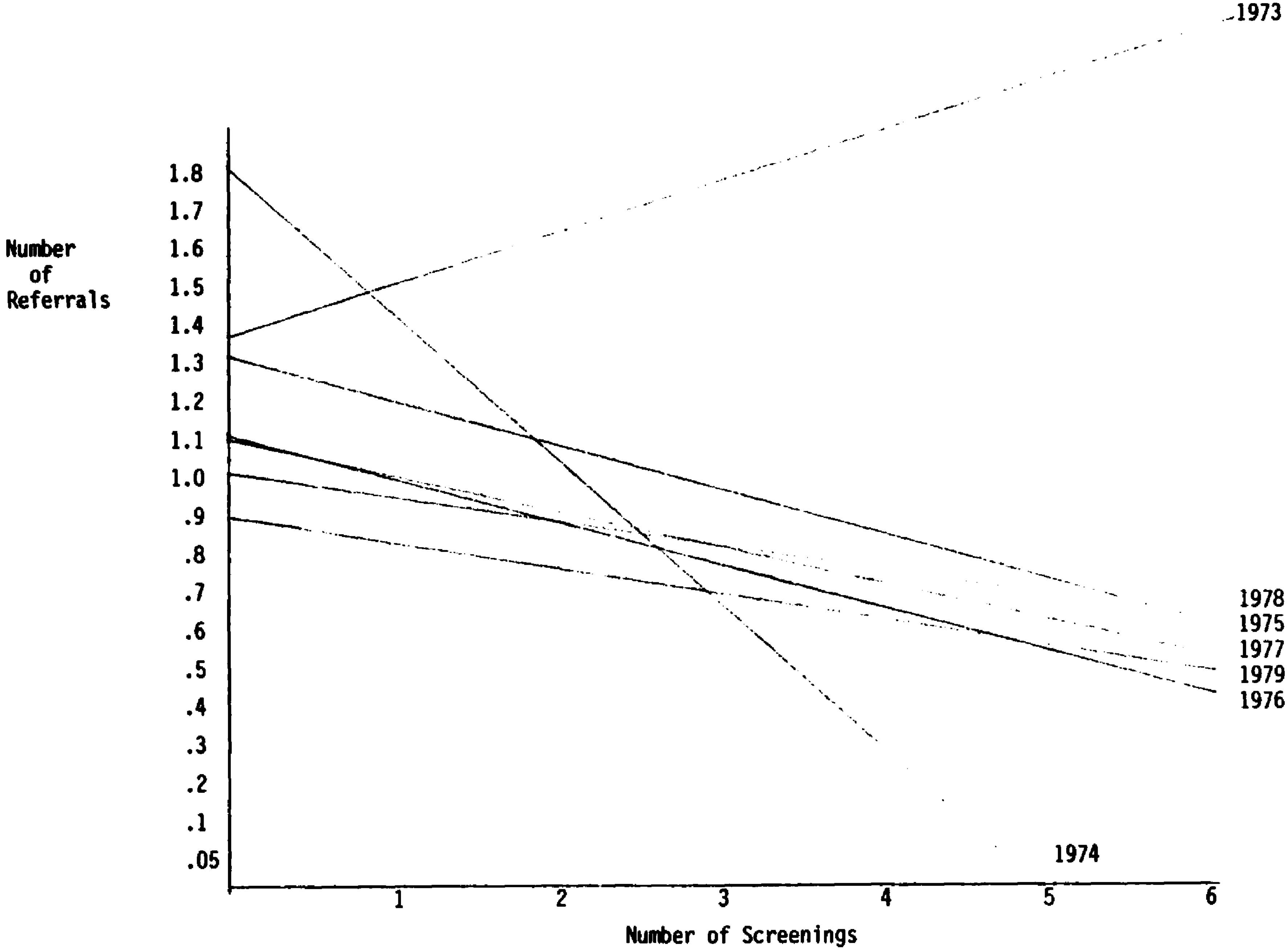

Figure III. Regression lines depicting the relationship between number of referrals and number of lifetime screenings for the long-term eligibles, by year of last screening for interaction model.

APPENDIX I

Table XVIII. Summary of the analysis of covariance for one-year eligibles.

Source	Sums of Squares	DF	F
1. SS due to interaction model	$R^2_{\text{Inter.}} = .03615$	13	$\frac{(1)/DF_1}{(4)/DF_4} = 29.46$*
2. SS due to additive model	$R^2_{\text{Add.}} = .03585$	7	$\frac{(2)/DF_2}{(4)/DF_4} = 54.29$*
(a) SS due to screening yr. adjusted for no. of screenings	$R^2_{\text{Add.}} - R^2_{\text{No. Screens}} =$ $.03585 - .01067$	1	$\frac{(2a)/DF_{2a}}{(4)/DF_4} = 267.02$*
(b) SS due to no. screens adjusted for screen. yr.	$R^2_{\text{Add.}} - R^2_{\text{Screen Yr.}} =$ $.03585 - .03447$	6	$\frac{(2b)/DF_{2b}}{(4)/DF_4} = 2.43$
3. SS due to interaction	$R^2_{\text{Inter.}} - R^2_{\text{Add.}} =$ $.03615 - .03585$	6	$\frac{(3)/DF_3}{(4)/DF_4} = 0.53$
4. SS Residual	$1 - R^2_{\text{Inter.}} = .96385$	10,216	

*Statistically significant at the .05 level

Calculations for Table XVIII tests:

1. For main effects of screening year with number of past screenings adjusted (2a in table):

$$\frac{.03585 - .01067}{1} \Big/ \frac{1 - .03615}{10{,}216} =$$

$$\frac{.02518}{1} \Big/ \frac{.96385}{10{,}216} =$$

$.02518 / .0000943 = 267.02$, significant given ${}_{.95}F_{1,\ 10216} = 3.84$

2. For main effects of lifetime screenings with screening year adjusted (2b in table):

$$\frac{.03585 - .03447}{6} \Big/ .0000943 =$$

$$\frac{.00138}{6} \Big/ .0000943 =$$

$.00023/.0000943 = 2.43$, not significant given ${}_{.95}F_{1,\ 10216} = 3.84$

3. For interaction (#3 in table):

$$\frac{.03615 - .03585}{6} \Big/ .0000943 =$$

$$\frac{.00030}{6} \Big/ .0000943 =$$

$.00005/.0000943 = 0.53$, not significant given ${}_{.95}F_{6,\ 10216} = 3.84$

APPENDIX J

The regression lines for each year are as follows per the interaction model:

For 1979, NR $= A + B_7$ NumScren
$= .8173 - .0401$ NumScren
$= .8173 - .2406$
$= .5767$

For 1978, NR $= (A + B_6) + (B_7 + B_{13})$ NumScren
$= (.8173 + .1594) + (-.0401 + - .0159)$ NumScren
$= .9767 + (-.0560)$ NumScren
$= .9767 + (-.336)$
$= .6407$

For 1977, NR $= (A + B_5) + (B_7 + B_{12})$ NumScren
$= (.8173 + .2206) + (-.0401 + - .0406)$ NumScren
$= 1.0379 + (-.0807)$ NumScren
$= 1.0379 + (-.4842)$
$= .5537$

For 1976, NR $= (A + B_4) + (B_7 + B_{11})$ NumScren
$= (.8173 + .2653) + (-.0401 + - .0557)$ NumScren
$= 1.0826 + (-.0958)$ NumScren
$= 1.0826 + (-.5748)$
$= .5078$

For 1975, NR $= (A + B_3) + (B_7 + B_{10})$ NumScren
$= (.8173 + .2965) + (-.0401 + .0435)$ NumScren
$= 1.1138 + (.0034)$ NumScren
$= 1.1138 + .0204$

$= 1.1342$

For 1974, NR $= (A + B_2) + (B_7 + B_9)$ NumScren

$= (.8173 + .4290) + (-.0401 + .1878)$ NumScren

$= 1.2463 + (.1477)$ NumScren

$= 1.2463 + .8862$

$= 2.1325$

For 1973, NR $= (A + B_1) + (B_7 + B_8)$ NumScren

$= (.8173 + 1.0454) + (-.0401 + - .2833)$ NumScren

$= 1.8627 + (-.3234)$ NumScren

$= 1.8627 - 1.9404$

$= -.0777$

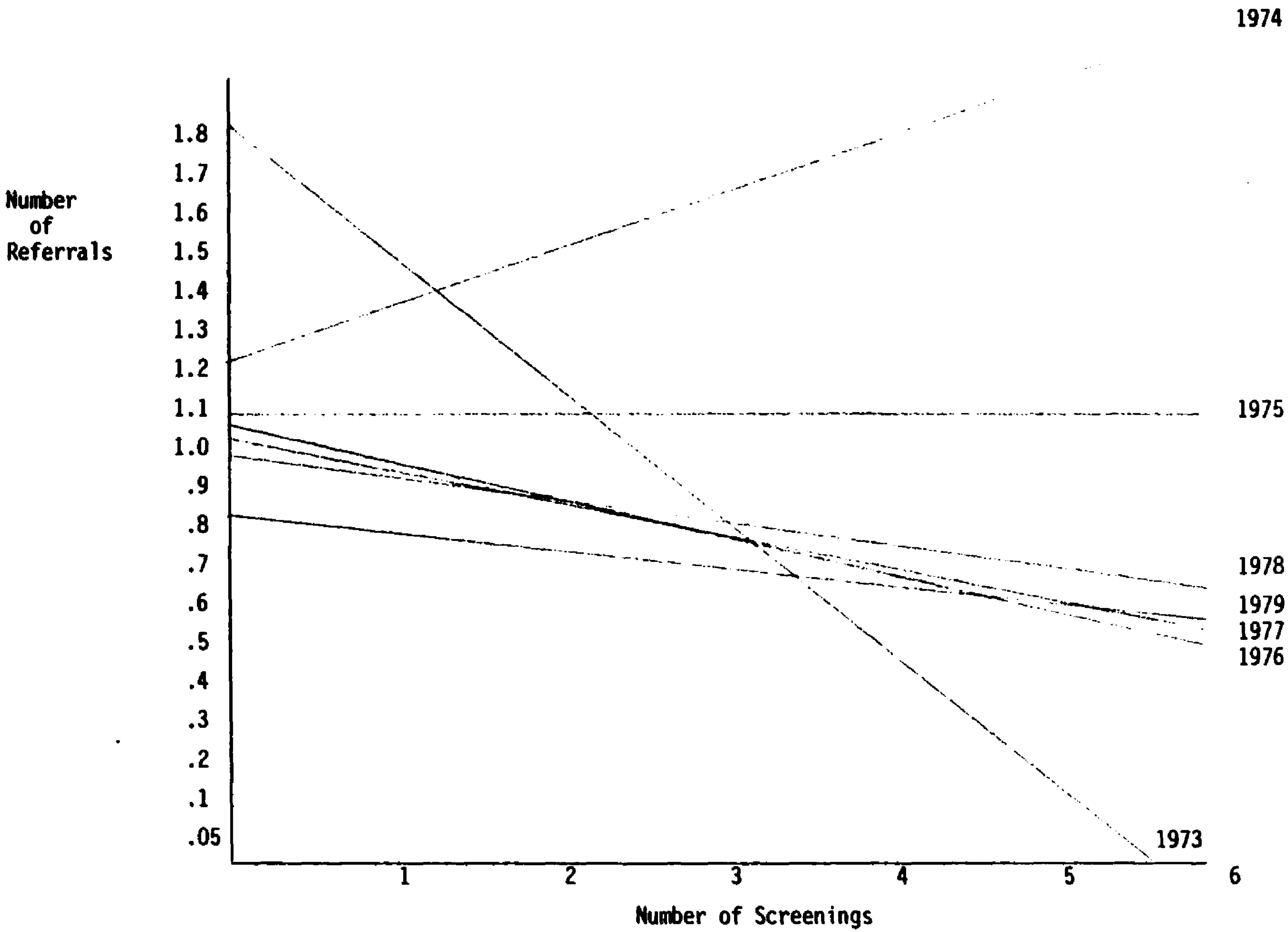

Figure IV. Regression lines depicting the relationship between number of referrals and number of lifetime screenings for the one-year eligibles, by year of last screening for interaction model.

With the interaction model it can be seen that the years 1975 and 1974 both have positive slopes contrary to the predicted direction. 1973 has a negative slope but for the same reason its slope was positive for the long-term eligibles. Only two rescreenings were sampled here for 1973, both of which had lower referral rates and standard deviations than those initially screened. Thus, this slope is negative based upon an inadequate number of subjects. This explanation also appears valid for the 1974 and 1975 outcomes. Again, these were early years for the program and the sample upon which the regression is done includes a relatively small number of rescreenings. In 1974, two dozen rescreenings were sampled, all of these for two screenings only. The mean was higher for this group than for those initially screened (and the standard deviation was lower) so the slope has to be positive. In 1975 the mean for those with two screenings was actually lower than the mean referral rate for those initially screened. However, five subjects were sampled with three screenings and their mean rate was highest of the three groups. This gave the line its very slight positive slope. These findings are actually consistent with the population data reviewed in Tables I and Tables II, i.e., the inverse relationship between referrals and number of screenings tends to appear consistently only when data are based on large numbers of subjects (100 or more at minimum). However, it is noted that the obtained F for each interaction term was less than the critical value for the .05 confidence level. This means no F was statistically significant for any interaction term.