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Traffic Safety
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Norms and Attitudes Related to Alcohol Usage and Driving: A Review of the Literature. Volume II: A Meta-Analysis of Primary Prevention Studies

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A D D E N D U M

Recognizing the magnitude and complexity of the alcohol-impaired driving problem, the National Highway Traffic Safety Administration reexamined its alcohol program and, in 1981, developed an Alcohol Highway Safety Program Plan calling for an integrated problem solving effort at all levels of government and society. The plan emphasizes six major points:

1. General Deterrence (short term): programs oriented toward deterring the majority of drunk drivers who are never arrested (rather than "treating" the few who are) for short term impact.

2. Community Focus: program emphasis and responsibility is placed at the local level.

3. Systems Approach: integration of the coordinating, enforcement, prosecution, adjudication, education/treatment, public information/education, and licensing functions at the local and State level, as appropriate.

4. Financial Self-Sufficiency: assessing fines, court costs, treatment tuition fees, etc., to convicted offenders to defray the costs of local and community programs.

5. Citizen Support: generating community and citizen support for comprehensive community programs (to provide a political base for increased countermeasure activity).

6. Prevention (long term): efforts toward changing societal attitudes toward drinking and driving through long-term prevention/education programs.

This report addresses the final point--development of programs for preventing alcohol-impaired driving. It is felt that achievement of long-term reductions in the magnitude of the drinking/driving problem necessitates the establishment of societal norms emphasizing individual responsibility and making alcohol-impaired driving unacceptable behavior. The intent of this report is to provide a foundation for developing prevention programs to achieve such long-term reductions in alcohol-impaired driving. The literatures on health prevention programs and on attitudes related to alcohol-usage and driving were reviewed as the first step in identifying promising approaches for preventing alcohol-impaired driving.

This report, in four volumes, summarizes (1) information available on attitudes related to alcohol-usage and driving, (2) factors associated with "successful" prevention programs, and (3) data on perceptions of the drinking/driving problem and its possible solutions collected through individual interviews and focus groups.

This report will be most useful to individuals interested in planning, designing, and developing programs to prevent alcohol-impaired driving, for it provides information about the issues which should be addressed when designing such programs. This report is not intended for use by program implementers, as it does not provide information on already-developed and tested drunk-driving prevention programs, nor does it provide detailed outlines on how to establish such programs.

State and local program designers/developers, health professionals and educators interested in drinking-driving programs may each find this report of interest. Those interested in changing attitudes about drinking and driving and in issues associated with attitude-change programs should find Volume I useful. Information about "success" factors associated with public health prevention programs (e.g., smoking, hypertension, substance abuse) can be found in Volume II. In designing drunk-driving prevention programs, this information can be used to avoid some of the pitfalls of previous health prevention efforts. Volumes III and IV contain information, collected through individual interviews and focus groups, on the drunk-driving problem and its possibilities for solution. While these data are based on small, selected samples and are not generalizable, they do provide insight into the magnitude and complexity of the drinking-driving problem. These two volumes may be of particular interest to persons working with youth programs, school-based programs and/or parent-child programs. Finally, a short, summary booklet outlining issues associated with, and providing suggestions for, developing drinking-driving prevention programs is included as part of this report. While this booklet is helpful in providing a short overview of suggestions for developing programs to prevent alcohol-impaired driving, users of this report are encouraged to refer to the appropriate volume containing the more complete background and empirical information when designing their drinking/driving prevention programs.

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16. Abstract This project provides information about norms and attitides related to alcohol use and driving. This volume reports the methodology, findings, discussion, and conclusions of a meta-analysis of primary prevention studies. Controlled studies dealing with the prevention of non-infectious diseases (e.g., heart attack, obesity, hypertension) were analyzed to determine what factors were associated with improvement in recipients receiving primary prevention interventions.

The findings indicated that programs in areas related to health or reducing accidents were more successful than programs in areas of substance abuse, mental health and deviance. Technological, pharmacological and combinations of education, information, technology and drug interventions were the most successful interventions. Further, when the site of the intervention was other than a school, the recipients experienced greater improvement. The author concluded that primary prevention interventions can be successful and useful in programming aimed at reducing the incidence of drinking and driving. Although additional primary prevention studies should be analyzed to confirm the outcomes in this study, the study establishes primary prevention as the logical basis for policies and programs aimed at coping with drunk driving and its consequences. Information on the other aspects of the project can be found in other volumes of this report as follows: Volume I - Review of the Literature; Volume III - Report of Individual Interviews; Volume IV - Report of Focus Groups; and a booklet entitled "Suggestions for Developing Prevention Programs to Reduce the Incidence of Alcohol-Impaired Driving."

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METRIC CONVERSION FACTORS

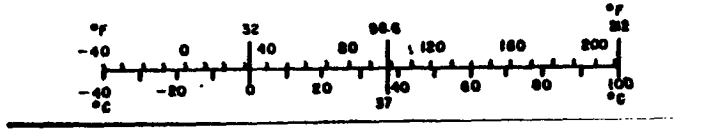
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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PREFACE

The following research was conducted under NHTSA contract #DTNH 22-81-C-07385 Norms and Attitudes Related to Alcohol Usage and Driving: A Review of the Relevant Literature. The purpose of this project was to provide a foundation for the development of prevention activities and programs to deter people from drinking and driving. To accomplish this purpose it was felt that, in addition to studying norms and attitudes, it was necessary to examine prevention studies to determine what factors influence the success or failure of prevention efforts.

This report analyzes prevention studies from the public health field and answers questions concerning 1) the percent of studies in which recipients of the prevention intervention are better off than the controls; 2) how much better off, the average person receiving an intervention is as compared to the controls; 3) what factors influence the degree of benefit the recipient of an intervention receives; and 4) what factors are associated with improvements in the recipient.

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SECTION I

INTRODUCTION

Primary prevention is the branch of public health which seeks to avoid the clinical manifestation of pathology such as injury, disease, or death. One motivation for studying primary prevention is that prevention is generally far less costly to society and victims than is remediation or palliation of pathology. The prevention of death and injury resulting from drunken driving has particular appeal because the clinical manifestations of death and injury are either irreversable, as in the case of death, or often very expensive to remediate, as in the case of serious injury. In addition, the extent of recovery possible from injury is oftentimes limited.

The types of studies involved with primary prevention extend over a broad range of interventions and problem areas sharing the common goal of seeking to avoid, rather than to treat, the occurrence of a pathology or problem. Despite its obvious potential benefits, primary prevention is a challenge to use wisely.

Primary prevention has been compared to the Okefenokee Swamp: "attractive from a distance . . . it lures the unwary into quagmires, into uncharted and impenetrable byways," (Murphy and Frank, 1979). Primary prevention is a largely untapped and unexplored resource, needing, not only detailed operating procedures and manuals, but some reliable road maps. Unlike clinical medicine and health care, which account for some 10 percent of the gross national product, the business of primary prevention is neither well established nor extensively researched. Primary prevention lacks a mature technology and large stock of experience. While literature reviews of primary prevention studies exist, those known to the authors (articles in Annual Review of Public Health and Annual Review of Psychology; Fielding, 1978; Schaps et al., 1980) have been either qualitative, or restricted to very few cases or one problem type only. Therefore, this study--meta-analysis--of primary prevention programs attempts to provide some of the roadmaps for developing primary prevention strategies that can be used to deter people from driving while intoxicated (DWI).

The present study provides a quantitative measure of the attractiveness of primary prevention. The figure of merit or "attractiveness" used is Glass et al.'s (1981) effect size which indicates how well (or poorly) the average person receiving the intervention (prevention program activity) fared compared with people in a control group. Effect sizes are computed on outcome measures (also known as "dependent variables" or "indicator variables"). These outcome measures reflect the success or failure of interventions as indicated by changes in behavior, stated attitude, notation of medical condition, or measured level of knowledge. In each instance the purpose of the outcome measure is to capture the effect (or lack of effect) of some intervention. The effect size is defined as the difference (on some outcome measure) between the mean of the group receiving the intervention and the mean of the control group divided by the standard deviation of the control group. The name given to the statistical analyses of the effect sizes is "Meta-analysis."

In order to chart the field of primary prevention, so it could be applied to the prevention of drunk driving, a sample of studies comparing the effects of receiving a primary prevention intervention with not receiving the primary prevention were identified, coded, and analyzed. The analyses permitted fundamental questions to be answered:

- In what percent of studies are the recipients of the prevention intervention better off than the controls?
- How much better (or worse) off is the average person who receives a primary prevention intervention compared with the controls?
- How does the degree of benefit vary by:
  -- type of problem addressed by the intervention?
  -- type of primary prevention intervention used?
  -- type of outcome measure?
- What are the success factors, i.e., the components of a primary prevention program that are associated with improvement in the recipients?

These questions were answered using statistical analyses including cross tabulations and multiple regression. In addition, a prototype decision support system (DSS) was constructed using the first 37 effect sizes computed. A decision support system permits the user to exploit statistical information quickly and easily. First, the DSS prompts the user to describe a potential intervention and its features. The DSS then responds by describing the probability that the intervention will have a negligible, medium, or high benefit. Another motivation for building the decision support system is that it can operate with incomplete data. This capability to handle incomplete data differs from the traditional statistical report which is hard to apply to a specific case in the absence of data. See Nagy, Nagy and Reggia (1982) which is attached as Appendix A, for a complete discussion of these issues.

SECTION II

METHOD

Sample

All studies in the sample met the inclusion criteria of being a primary prevention study in which persons who received the primary prevention intervention were compared to persons in a control group. Again, the distinction between primary, secondary, and tertiary prevention is that the former seeks to prevent the occurrence of pathology while the latter seek to limit the damage caused by the pathology or to aid in recovery. An example of this distinction would be the prevention of poisoning versus the treatment of poisoning victims.

Studies were excluded from the sample if they dealt with infectious diseases because infectious diseases can be handled with tactics unique to them, namely, innoculation and quarantine. Conversely, non infectious diseases make use of interventions other than innoculation and quarantine such as education, information, technology and legislation.

The units of analysis were individual effect sizes showing how well persons receiving the intervention fared relative to persons in a control group. One effect size was calculated for each outcome measure (dependent variable) from each study. In all there were 94 effect sizes which arose from 37 studies.

Initially, a random sample consistent with the above inclusion and exclusion criteria was to be drawn from the UCLA Data Base of Program Evaluations. However, repeated efforts to use this source failed, due to non-cooperation. Eventually, 100 studies satisfying our criteria were located through computerized searches and consultations with individuals. See Appendix B, "Identifying and Locating Studies" for more detail.

The hundred studies were reduced to a total of 37 after eliminating those which closer inspection revealed did not meet the inclusion/exclusion criteria or whose effect sizes were too difficult or impossible to compute. Although Glass, et al. (1981) provide numerous methods for computing effect sizes from a wide variety of statistical results, the determination of whether one or any of his methods is applicable is time consuming and involved. In the majority of cases in which studies were eliminated, the problem stemmed from difficulty in computing the effect size, due to the incomplete reporting of statistical results. From these remaining 37 studies, the 94 effect sizes were calculated. See Appendix C for a list of the 37 studies used in the meta-analysis.

Instruments

Features of the studies were operationalized by constructing a code book. The code book was based on the two seminal sources for meta-analysis: Glass, McGaw, and Smith (1981) and Smith, Glass, and Miller (1980), as well as the epidemiological/technological view of Baker (1973). The major features that

were coded included: type of sample (whether from a population at risk or not); type of problem; type of intervention; type of outcome; frequency of contact with intervention; site of intervention; level of demand on subjects; and whether a check was made on the extent to which the intervention was received. These features were used because a basic motivation for this study was to investigate the level of success or failure of primary prevention by:

- problem type,
- intervention type, and
- outcome type,

as well as other major features of the studies.

Because another prime objective for the study was the identification of success factors, additional potential success factors were coded (i.e., sample size, research design, length of follow-up period). Unfortunately, these were not used because of excessive missing data or insufficient variance. The chart which follows highlights the variables coded.

Major Features of Studies and Their Definitions

Variable	Definition
1. Sample was chosen for being at risk for the problem under study.	1 = sample was drawn from a population at high risk (manifesting some symptom of the problem) or at risk (having the potential of manifesting the symptom in the absence of intervention). 0 = the sample was drawn from a population neither "at risk" nor at "high risk" for the problem.
2. Problem addressed by the intervention	1 = physical condition 2 = accidents 3 = substance abuse 4 = psychological/deviance
3. Intervention Type	1 = technology 2 = drugs 3 = combination 4 = education 5 = other (psychotherapy or legal) 6 = information/media
4. Outcome Type	1 = physical condition 2 = knowledge or attitude 3 = behavior

Major Features of Studies and Their Definitions (Cont'd)

5. Frequency of contact is high	1 = the intervention involved 3 or more contacts 0 = the intervention involved less than 3 contracts.
6. Site of the intervention is a school	1 = the environment in which the treatment was administered was a school 0 = the environment in which the treatment was administered was not a school but a home, place of work, medical clinic, hospital, mental health center, other public facility, more than one of the above, other or unspecified.
7. Level of demand on the subject is minimal	1 = demand on the subject is minimal (for example, the proper use of child-resistant medicine container) 0 = demand on the subject is high; the subject is required to change a long standing habit.
8. At least one check was made to measure whether the intervention was received	1 = at least one of the following checks was made: pencil and paper test or questionnaire, physiological test, second review, interview, observation, combination, other. 0 = no check(s) was indicated

See Appendix D for a copy of the code book which shows all the features coded.

Procedures

Two staff members coded the studies. Based on a sub-sample of independently coded experiments, the inter-rater reliability is estimated to be between 0.8 and 0.9, which is judged to be satisfactory. The effect size was coded using information and formulas contained in chapter five of Glass et al. (1981) and the appendix, "Formulas and conventions for calculating effect sizes" in Smith et al. (1980).

SECTION III

FINDINGS

Amount of Benefit Based on All 94 Effect Sizes

Statistical analysis of the 94 effect sizes from the 37 primary prevention experiments showed that in more than 86 percent of all comparisons, the average person who received a primary prevention intervention fared better than the average control. This result is evident from inspection of Table 1, the simple frequency distribution of all 94 effect sizes found on the next page. The effect sizes ranged from -0.7 to 3.8. In approximately five percent of the comparisons, the effect size is negative, indicating that the intervention left the average recipient of the intervention worse off than did no intervention at all. Of all five studies that produced negative effect sizes, two used educational interventions and three psychotherapy. Finally, approximately nine percent of comparisons showed no effect, either positive or negative. These results were random and were scattered among all the interventions.

Turning to the question of the average benefit (if any) accruing from receiving a prevention intervention, the same Table 1 indicates a median effect size of 0.6. An effect size of 0.6 means that the average person receiving a primary prevention intervention fared better than 72 percent of all the controls. (The mean effect size is 0.75, somewhat higher than the medium effect size because the absolute magnitude of the highest effect sizes was greater than that of the lowest effect sizes.)

Next the average amount of benefit was examined separately for:

- type of problem addressed by the intervention;
- type of primary prevention intervention used; and
- type of outcome measure.

Amount of Benefit for Different Problem Areas

The greatest benefits were found in primary prevention studies attempting to improve physical health or to reduce accidents. In both these problem types, the average person receiving the intervention was better off than 79 percent of the control group. The three major interventions used were pharmacological, technical, and combinations of interventions. Less benefit resulted in attempting to reduce substance abuse and to improve mental health or reduce deviant behavior: the average recipient of the prevention strategy exceeded 66 percent of the controls in substance abuse studies and 60 percent of the controls in psychological health and deviance studies. Table 2 on the next page shows median benefit in each of the four problem types as well as the number of effect sizes in each of the problem types which were available for analysis.

Table 1

Simple Frequency Distribution of Effect Sizes

Effect Size	Frequency	Cumulative Frequency	Percent	Cumulative Percent
-0.7	1	1	1.06	1.06
-0.6	1	2	1.06	2.12
-0.5	1	3	1.06	3.19
-0.4	1	4	1.06	4.25
-0.2	1	5	1.06	5.31
0.0	8	13	8.51	13.83
0.1	2	15	2.12	15.95
0.2	15	30	15.95	31.91
0.3	4	34	4.25	36.17
0.4	7	41	7.44	43.61
0.5	3	44	3.19	46.80
0.6	9	53	9.57	56.38
0.7	3	56	3.19	59.57
0.8	11	67	11.70	71.27
0.9	1	68	1.06	72.34
1.0	5	73	5.31	77.66
1.2	3	76	3.19	80.85
1.3	2	78	2.12	82.97
1.4	3	81	3.19	86.17
1.7	1	82	1.06	87.23
1.8	1	83	1.06	88.29
1.9	1	84	1.06	89.36
2.2	1	85	1.06	90.42
2.3	3	88	3.19	93.61
2.5	3	91	3.19	96.80
2.7	1	92	1.06	97.87
3.3	1	93	1.06	98.93
3.8	1	94	1.06	100.00

Table 2

Amount of Benefit by Problem Type

By Problem Type	Percent of Controls Surpassed by Average Person Receiving Intervention	Number of Effect Sizes
1. Physical Condition	79	21
2. Accidents	79	24
3. Substance Abuse	66	33
4. Psychological/Deviance	60	16
	Total	94

Amount of Benefit in Different Interventions

Technological interventions, such as child-resistant medicine containers and drug therapies for persons with the early stages of hypertension, as well as combinations of interventions yielded the highest average benefits. The average person receiving these interventions fared better than 99 percent, 82 percent, and 79 percent of the controls, respectively.

Primary prevention based on education or information did relatively poorly, as did "other" interventions (these are comprised of psychotherapy and legal). Interventions with fewer than nine effect sizes were grouped together as "other." The average person receiving education, information, or "other" interventions fared better than 66 percent, 58 percent, and 59 percent of the controls, respectively.

Interestingly, primary prevention based on a combination of both education and information did quite well. As previously stated, outcome measures included knowledge, attitude, physical condition, and behavior. In 80 percent of studies using a combination of education and media, the average person surpassed at least 66 percent of the controls. In those combinations of treatment programs in which both education and information were not used, in only 46 percent of the time did the recipients exceed at least 66 percent of the controls. See Table 3 for the percent of controls surpassed by the average person receiving each intervention type. Table 3 also shows the number of effect sizes on which this measure of benefit is based.

Table 3

Amount of Benefit by Intervention

By Intervention Type	Percent of Controls Surpassed by Average Person Receiving Intervention	Number of Effect Sizes
1. Technology	99	9
2. Drugs	82	10
3. Combination	79	28
4. Education	66	21
5. Other (Psychotherapy or Legal)	59	13
6. Information/Media	58	13
Total		94

Amount of Benefit Based on Different Outcome Measures

Physical health measures (e.g., blood pressure, mortality rates) showed the greatest improvement: the average person receiving a primary prevention intervention in a program that measured physical health fared better than 84 percent of persons in the control group. Persons in primary prevention programs which measured their outcome in terms of behavior or knowledge or attitude change showed, on the average, a more modest improvement. Those receiving an intervention did better than 66 percent to 67 percent of the controls, respectively. See Table 4.

Table 4

Amount of Benefit by Outcome Measure

By Outcome Measure	Percent of Controls Surpassed by Average Person Receiving Intervention	Number of Effect Sizes
1. Physical Condition	84	28
2. Knowledge or Attitude	67	20
3. Behavior	66	46
Total		94

Success Factors

Stepwise linear regression was performed to determine which factors were most closely associated with the success or failure of primary prevention interventions. Candidate success factors were added until no more met the stopping rule for adding predictors to the model: a predictor is not entered unless the probability that its regression weight is zero, is less than 15 chances out of 100 (Helwig and Council, 1979). This stopping rule was used to avoid entering variables that made negligible contributions to our understanding of the correlates of success and failure.

The dependent variable was the effect size trichotomized as follows:

1 if the effect size was less than 0.4;
2 if the effect size was between .4 and .99;
3 if the effect size was greater than .99.

Trichotomization was performed to prevent distortion of the regression analysis due to extreme values. Nine variables were used in the regression analysis. Six of them met the criterion for inclusion. The remaining variables had either too much missing data or too little variance. All of the variables, their definitions and the values of the variables associated with success are shown in Table 5.

Table 5

Major Features of Studies and Their Definitions

Asterisk(*) denotes value of variable associated with success. If no value of a variable is marked with an asterisk, than the variable is not a success factor.

Variable	Definition
1. Type of sample	1 = sample was drawn from a population at high risk (manifesting some symptom of the problem) or at risk (having the potential of manifesting the symptom in the absence of intervention). *0 = the sample was drawn from a population neither at risk nor at high risk for the problem.
2. Frequency of contact is high	*1 = the intervention involved 3 or more contacts 0 = the intervention involved less than 3 contacts.
3. Site of the intervention is a school	1 = the environment in which the treatment was administered was a school. *0 = the environment in which the treatment was administered was not a school but a home, place of work, medical clinic, hospital, mental health center, other public facility, more than one of the above, other or unspecified.
4. Level of demand on the subject is minimal	*1 = demand on the subject is minimal (for example, the proper use of child-resistant medicine container) 0 = demand on the subject is high; the subject is required to change a long standing habit.
5. Type of outcome measure is a behavior	1 = outcome measure is a behavior. *0 = outcome measure is knowledge, attitude or physical condition.
6. Type of intervention is more than one single intervention	*1 = intervention consists of more than one of the following interventions: education, information, technology, drugs, other (psychotherapy or legal). 0 = Intervention consists of just one of the following interventions: education, information, technology, drugs, other (psychotherapy or legal).

Table 5 (Cont' d)

Major Features of Studies and Their Definitions

Variable	Definition
7. Type of intervention is education	1 = intervention consists of education. 0 = intervention is not education.
8. Type of intervention is information	1 = intervention consists of information. 0 = intervention is not information.
9. Type of intervention is technology	1 =intervention is technology 0 = intervention is not technology
10. Extent to which receipt of the intervention was checked	1 = at least one check was reported. 0 = no checks were reported.

The extent of benefits to be expected from primary prevention programs is at least moderately predictable (R^2 = .35). The best predictors are the type of population used, the characteristics of the intervention and the setting of the intervention.

Table 6 shows the results of the stepwise linear regression.

Table 6

Stepwise Regression Procedure for
Dependent Variable Effect Size Category

R SQUARE = 0.356

	DF	Sum of Squares	Mean Square	F	Prob F
Regression	6	21.14	3.52	8.03	0.0001
Error	87	38.17	0.43		
Total	93	59.31			

	B Value	STD Error	Type II SS	F	Prob F
Intercept	2.27				
Risk	-0.78	0.24	4.66	10.63	0.001
Frequency	0.60	0.20	3.64	8.31	0.005
School	-0.53	0.16	4.66	10.63	0.001
No Effort	0.50	0.20	2.53	5.77	0.018
Behavior	-0.36	0.14	2.80	6.40	0.013
Combination	0.44	0.18	2.53	5.77	0.018

Additional Analyses

The above findings raised additional questions. Schools are convenient sites for prevention efforts. What factors are most closely associated with success in prevention efforts whose sites are schools? To answer this question stepwise regression analysis was performed on the 34 effect sizes which arose from studies done in schools. The three variables most closely associated with success consisted of:

1. No checks were indicated to measure the extent to which subjects received the treatment;

2. The outcome measure of the experiment was not behavior; and

3. The intervention strategy used was not information.

Table 7 below shows the regression analysis.

Table 7

Success Factors When Site = School

Stepwise Regression Procedure for
Dependent Variable Effect Size Category

R SQUARE = 0.257

	DF	Sum of Squares	Mean Square	F	Prob F
Regression	3	2.18	0.72	3.47	0.028
Error	30	6.28	0.20		
Total	33	8.47			

	B Value	STD Error	Type II SS	F	Prob F
Intercept	2.01				
Check	-0.34	0.19	0.65	3.14	0.086
Behavior	-0.36	0.16	0.99	4.74	0.037
Information	-0.51	0.19	1.39	6.68	0.014

Crosstabulation analysis supplemented the above regression analysis and showed that combinations of interventions worked relatively well in school settings but education-based interventions did not. See Table 8 below.

Table 8

Crosstabulation of Two Intervention Types in the School Setting by Trichotomized Effect Size

	Effect Size		
	Less than .4	Between .4 and .99	Greater than .99
Intervention			
Education	9	10	0
Combination (e.g., Education and Information)	5	9	7

Since behaviors are frequently the object of change in prevention efforts, regression analysis was undertaken to seek success factors in these sorts of studies. Table 9 below shows that the two variables most closely associated with success consisted of:

1. The site of the study was not a school; and

2. The intervention consisted of a combination of educational, informational, pharmacological and technological interventions.

Table 9

Stepwise Regression Procedure for Dependent Variable Effect Size Category

R SQUARE = 0.21970167

	DF	Sum of Squares	Mean Square	F	Prob F
Regression	2	6.00	3.00	6.05	0.004
Error	43	21.32	0.49		
Total	45	27.32			

	B Value	STD Error	Type II SS	F	Prob F
Intercept	1.77				
School	-0.57	0.21	3.48	7.02	0.011
Combination	0.49	0.22	2.42	4.88	0.032

The average person in a prevention program in which the problem addressed was substance abuse, fared better than only 66 percent of the controls (see

Table 2). Since the goal of any DWI prevention program would be to change alcohol use habits as they relate to drinking and driving, further analysis was conducted to determine what factors were related to positive outcomes for substance abuse. Table 10 below indicates that the two variables most closely associated with success consisted of:

1. The site of the study was not a school, and

2. The intervention was not information.

Table 10

Problem Type = Substance Abuse

Stepwise Regression Procedure for Dependent Variable Effect Size Category

R SQUARE = 0.43202531

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB F
REGRESSION	2	5.60	2.80	11.41	0.0002
ERROR	30	7.36	0.24		
TOTAL	32	12.96			

	B VALUE	STD ERROR	TYPE II SS	F	PROB F
INTERCEPT	2.42				
SCHOOL	-0.86	0.21	4.00	16.29	0.0003
INFO	-0.56	0.30	0.84	3.45	0.0730

NO OTHER VARIABLES MET THE 0.1500 SIGNIFICANT LEVEL FOR ENTRY INTO THE MODEL.

SECTION IV

CONCLUSIONS

The fact that, in 86% of all comparisons, the average person receiving a primary prevention intervention fared better than the average person in the control group indicates that primary prevention holds substantial potential for reducing the effects of DWI accidents. Further support is furnished by the fact that the average person receiving a primary prevention intervention fares better than all but 28% of persons not receiving the intervention.

Additional scrutiny shows that when the problem type is physical condition or accident, the average person receiving the primary prevention intervention exceeds all but 27% of the group not receiving the intervention. Furthermore, in those studies measuring physical condition as the indicator of success or failure, the average person receiving the intervention fared better than all but 16% of those in the control group. Finally, persons receiving technological interventions fared better than all but 1% of the control group (caution should be exercised in interpreting this finding due to the small number of effect sizes on which it is based).

Especially encouraging is the finding that, although both education and information are less effective when used alone, in combination they exhibit a synergistic effect. In 80% of the studies using a combination of education and media, the average person receiving the intervention fared better than at least 66% of the controls.

Because success is moderately predictable ($R^2 = .35$) the success factors identified by the meta-analysis can be used in strategic planning of primary prevention programs to deter DWI. However, these highly encouraging findings must be tempered by the fundamental question of epidemiology. "Is it (the reported finding) real?" There is no substitution in science for replication; therefore, further samples of primary prevention programs should be analyzed to confirm the outcomes reported in this study. In summary, this study establishes primary prevention as the logical basis for policies and programs aimed at coping with drunk driving and its consequences.

Additional Conclusions

Meta-analysis is judged to be a useful supplement to traditional, qualitative literature reviews, but due to low standards in reporting the results of studies and the newness of meta-analysis itself, a great deal of time and effort is required to perform and interpret meta-analyses.

The Knowledge Management System (KMS) could be used to improve the speed and accuracy of coding studies including calculating effect sizes.

Glass et al. (1981) provide some 15 formulas for estimating the effect size based on different sets of statistical results which re-

searchers commonly furnish. Deciding which formula to apply and then making the required calculations is often complex and error prone. KMS supports both rule-based deduction (characterized by if-then logic) and calculations. There is, therefore, considerable potential for saving time and improving the accuracy of the findings by writing another DDS (decision support system), not for the end user, but for the DDS producer. This DSS will prompt for whatever set of statistical results the researcher reported and either calculate the effect size or indicate that based on the inputs furnished, no effect size can be calculated.

Furthermore, the speed and reliability of coding of the studies can be improved by constructing a decision support system for coders which will prompt them for features of studies and use production system logic to develop higher level inferences such as the type of experimental design used (Nagy, Nagy, and Reggia, 1982).

If information from meta-analysis is used routinely, then it should be highly advantageous to continue to supplement traditional methods of reporting results with the more convenient format of the decision support system model which permits the policy maker to rank proposals and to perform "what if" analysis easily and quickly, despite missing data on some success factors (Nagy, Nagy, and Reggia, 1982).

SECTION V

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SECTION VI

APPENDICES

APPENDIX A
"A Prototype Decision Support System for Predicting Effects of Alternative Policies: A Case Study Using the Knowledge Management Support System"

A PROTOTYPE DECISION SUPPORT SYSTEM FOR PREDICTING EFFECTS OF ALTERNATIVE POLICIES: A CASE STUDY USING THE KNOWLEDGE MANAGEMENT SYSTEM

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Government decision makers are often faced with the formidable task of choosing between a very large number of possible policy interventions and configurations of policy interventions. Meta-analysis, a statistical technique for summarizing the outcomes of policy experiments, should be of assistance to decision makers in ranking and fine-tuning policy. Unfortunately the typical meta-analysis is not immediately useful to the decision maker.

This paper is a case history of the construction of a prototype decision support system (DSS) to enable decision makers to reap the benefits of meta-analysis without making a prohibitive investment in time or cost. We describe the requirements of the DSS and how we were able to meet these requirements by using the Knowledge Management System, a very high level programming environment for constructing DSS's. After describing the four step technique for building a DSS using the Knowledge Management System, we show a sample user session with the resulting prototype DSS and summarize the lessons learned.

Key words: Artificial intelligence, Bayesian classification, case history, decision making, decision support system, knowledge base, meta-analysis,very high level programming environment.

1. Introduction

One of the most important and difficult tasks facing any decision maker is evaluating alternative policies for accomplishing a goal. An immediate difficulty is the large number of plausible combinations of policy interventions available (e.g., educational programs, child-resistant containers, etc.). An even larger number of combinations of policy configurations (target problems addressed by the intervention, indicators of success or failure, etc.) face the decision maker. Despite the difficulties, the decision maker must rank potential policies based on some criteria. In addition, he or she often needs to examine the most promising policies further by assessing the impact of changing some of their features. Finally, the rankings and evaluations must be communicated and defended. In the past, both the rank-

ings of the alternatives and the appraisal of the "what if" exercise have been subjective and unpersuasive as well as difficult to explain to others.

If the policies under consideration have been tested experimentally, then the decision maker should be in a better position to rank them. Unfortunately this potential is seldom realized for at least two reasons. First, different outcome measures are used to assess the effect of the policies, and second, the results of the experiments are reported in a bewildering number of ways. This lack of uniformity of measurement and reporting can be overcome at least in part by meta-analysis, "the statistical analysis of the summary findings of many empirical studies" [1].

In meta-analysis, comparisons of persons who received some policy versus persons in a control group who have not received the policy are translated into a common metric called an effect size. The effect size shows how well the average person who received the policy fared compared with persons in the control group who did not receive the policy. Standard statistical analyses (for example, chi square or multiple regression) can then be performed to identify which features of the policy can predict the effect size. Based on these analyses, objective ranking and objective "what if" analysis can subsequently be performed.

Although an increasing number of meta-analyses are being reported in the scientific literature [2,3,4], decision makers rarely use meta-analyses for evaluating policies. They are deterred by the heavy investment in time and effort required to incorporate the results of meta-analysis into the judgements which they must make. These latter problems, however, can be overcome by using a decision support system (DSS) to reduce the amount of time and effort needed to reap the benefits of meta-analysis. As Keen and Scott Morton point out, the DSS is interactive software which supports rather than attempts to replace the decision maker [5]. The DSS accomplishes this task by handling the structured as opposed to the unstructured or fuzzy aspects of decisions. In the case of use of meta-analysis, the DSS can estimate the likely level of improvement to be realized from particular features of a policy. These estimates are based on the experimental studies of similar policies. What the DSS cannot do and does not attempt to do is automate the selection process--there are far too many critical, subjective and situational factors which require a competent, human decision maker.

This paper documents the construction of a specific DSS to aid the decision maker in judging alternative policies and in assessing the merits of different configurations of the same policies. First, we describe the features required of the DSS. Second, we explain how we met the requirements by using a very high level programming environment developed specifically for building decision support systems, the Knowledge Management System [6]. Third, we show a sample user session with the DSS. Fourth, we summarize the lessons learned and indicate future plans for

expanding the DSS using additional capabilities of the Knowledge Management System.

2. Decision Support System Requirements

The capabilities needed by the DSS should by now be familiar:

(1) help the decision maker rank alternative policies, and

(2) help the decision maker fine tune the best policy.

The decision maker does not always know all details of various policies. Therefore, the DSS needs to operate even when various features of policies are not known. The DSS needs to accept inputs of 'unknown' and make estimates based on features of the policies that the decision maker is able to supply.

The DSS must be user friendly-- due to time pressures facing decision makers, the DSS must be very easy to learn, requiring no more than a demonstration. The DSS must be easy to use, displaying information when it is needed, prompting the user for inputs from a menu, permitting the user to request clarifications such as definitions of terms, and protecting the user from careless errors by checking the users' inputs.

Finally, the DSS has to be built quickly and inexpensively to remain within the limits of contractual time and cost.

3. Constructing a DSS with the Knowledge Management System

In this section we will describe the Knowledge Management System (KMS) and how its capabilities enabled us to build a DSS with the required capabilities very quickly (in four person days) and inexpensively (with $60 of computer time). We then show the steps taken to build the DSS.

3.1 The Knowledge Management System and Its Features

The ideal programming environment for constructing the DSS would have a built-in robust, friendly user interface as well as a built-in statistical method which would function even in the face of missing values. These features would eliminate a great deal of programming or interfacing time and effort. As indicated below, the Knowledge Management System [6,7] contains both vital features:

"KMS was designed to greatly simplify the process of building a DSS. In essence, KMS provides completed programs that implement a standardized, application-independent user interface mechanism. In addition,

KMS also has access to a library of programs that support a variety of inference methods. Constructing a DSS with KMS therefore requires only that an application specialist provide KMS with a knowledge base. This is done by encoding relevant problem-solving knowledge using the very high-level language supported by KMS for this purpose. The encoded knowledge base is subsequently given to KMS which checks it for errors. If no errors are found, KMS adds an inference mechanism to the knowledge base to complete the DSS." [7, p.9]

In addition to furnishing the tools of DSS construction, the KMS manual suggests a four step process for constructing a DSS. These steps and how we performed the steps are the subject of the next section.

3.2 KMS's Four Steps For Creating a DSS

The four steps in the KMS approach to building a DSS consist of:

(1) Organize the problem specific information into a problem-oriented attribute hierarchy. In our case, we want to use features of policies to predict improvements (if any) in persons who receive the policies relative to those who do not receive the policy.

(2) Select an approach for representing and processing information derived from meta-analysis of policy experiments.

(3) Encode the knowledge base consisting of information from the meta-analysis.

(4) Test and certify the resulting DSS.

3.2.1 Constructing the Attribute Hierarchy

The attribute hierarchy provides a framework for representing information about a specific problem for which the DSS is to be built. The attribute hierarchy shows the input attributes or features of a policy which the decision maker inputs. It also shows the inferred attribute which the DSS calculates: the expected payoff from a given set of values of the input attributes.

The inferred attribute was dictated by the nature of our problem. The input attributes resulted from a priori specification of variables deemed important to the decision makers as well as features of policies which were found to be associated with effect size in analysis of 17 policy experiments which yielded a total of 47 effect sizes (most experiments produced more than a single effect size). Figure 1 shows the problem oriented attribute hierarchy.

Effect Size category

problem addressed	demand on subject	type of treatment	type of outcome measure

Figure 1. Problem Oriented Attribute Hierarchy

3.2.2 Selecting an Approach for Representing and Processing the Knowledge

Because of the need to handle cases in which values of some input attributes would not be available, a Bayesian classification scheme was selected as the basis for estimating payoff from configurations of policies. Another important reason for choosing Bayesian classification with its categories of possible outcomes was to convey the fact that these estimates were necessarily approximate rather than exact. Instead of making point estimates of the outcome of policies, the DSS would use the Bayesian procedure to classify the forecasted effect sizes as "High", "Medium" or "Negligible". An effect size was defined to be high if the average person who received the treatment was better off than more than 85 per cent of persons in a control group which did not receive the policy. An effect size was defined to be medium if the average person who received the policy intervention or treatment fared better than between 65 per cent and 84 per cent of persons in a control group which did not receive the policy. If the average person in the group which received a given policy intervention did not do better than at least 64 per cent of persons in the control group, then the effect size was defined to be negligible.

The KMS subsystem, KMS.BAYES, was selected to implement this choice.

3.2.3 Encoding the Knowledge Base

The DSS requires a knowledge base, a collection of encoded knowledge which is combined with the decision maker's inputs and the Bayesian procedure to supply rankings and results from "what if" exercises. The Bayesian procedure requires prior and conditional probabilities [7]. These probabilities constitute the knowledge encoded into the knowledge base. The procedure for generating these probabilities is summarized below.

The prior probabilities are the base rates for the three effect size categories. Table 1 below shows the

prior probabilities.

Table 1. Prior Probabilities or Base Rates of Effect Size Categories

Effect Size Category	Prior Probability
High	.32
Medium	.32
Negligible	.36

Next the categories of effect sizes (high, medium, negligible) were cross tabulated with attributes of the policy such as principal type of policy intervention (educational, media, etc.), type of problem addressed (substance abuse, etc.), type of outcome measurement (behavior, physical health, etc.), and level of behavioral demand (high or low). The cross tabulation provided the conditional probabilities. Note, for example, in Table 2 below that the conditional probability of the problem addressed was substance abuse given that the outcome or effect size category was negligible was 0.29.

Table 2. Cross Tabulation of Effect Size Category with Features of Policies

	Effect Size Category		
	Neglig.	Medium	High
Feature of Policy			
Problem Addressed			
Substance Abuse	0.29	0.53	0.00
Accidents	0.24	0.20	0.47
Physical Health	0.06	0.27	0.33
Mental Health	0.41	0.00	0.20
Demand on Subject			
High	0.76	0.80	0.13
Low	0.24	0.20	0.87
Type of Treatment			
Educational	0.24	0.47	0.07
Media	0.29	0.07	0.20

Technological	0.12	0.00	0.47
Other	0.35	0.46	0.26
Type of Outcome Measure			
Knowledge or Attitude	0.29	0.47	0.00
Behavior	0.71	0.33	0.27
Physical Health	0.00	0.20	0.73

The appendix shows the encoding of the prior and conditional probabilities into the knowledge base.Note that the Appendix contains all the code that was needed to produce the DSS shown in the sample session.

3.2.4 Testing and Certification of the DSS

The DSS was tested by activating KMS.BAYES at the University of Maryland and adding the text file containing the knowledge base. KMS.BAYES screened the knowledge base for errors. When the errors were eliminated the DSS was ready for use. A sample session is shown in the next section.

Full testing and certification has not been completed, but lessons learned from testing to date are given in the conclusions section of this paper.

4. Sample Decision Maker Session with the DSS

The typical decision maker will have either several proposals to evaluate or a single policy proposal to fine tune. The decision maker begins by accessing the DSS. The resulting dialogue proceeds as shown below in Table 3. User inputs are underlined to help distinguish them from the system's prompts and responses.

Table 3. Sample User Session with the DSS

```
@ADD KMS*KMS.BAYES
WELCOME TO KMS.BAYES (4 9 82)
ENTER KMS.BAYES KNOWLEDGE BASE:
@ADD KB.PILOT6

KNOWLEDGE BASE ACTIVATED-NO ERRORS DETECTED

*THIS IS AN UNCERTIFIED KNOWLEDGE BASE*

THIS SYSTEM CLASSIFIES PROPOSED PREVENTION PROGRAMS BY
ESTIMATING THE PROBABILITY THAT THEY WILL PRODUCE
```

EITHER NEGLIGIBLE, MEDIUM OR HIGH BENEFITS. TO GET THE SYSTEM TO ESTIMATE THE BENEFITS OF A PROGRAM, ANSWER THE FOLLOWING QUESTIONS. ANSWER 'UNKNOWN.' IF YOU CANNOT SUPPLY AN ANSWER TO A QUESTION.

NOTE: THIS SYSTEM IS FOR DEMONSTRATION PURPOSES ONLY!

TYPE 'CONTINUE.' TO BEGIN

READY FOR COMMAND:
CONTINUE.
PROBLEM ADDRESSED BY TREATMENT:
(1) SUBSTANCE ABUSE
(2) ACCIDENTS
(3) PHYSICAL HEALTH
(4) MENTAL HEALTH
= ?
2.

DEMAND ON SUBJECT:
(1) HIGH
(2) LOW
=?
HELP.

COMMAND ENCOUNTERED- DEFERRING CURRENT QUESTION

TRY "HELP ANSWER." OR "HELP COMMAND."
YOU MAY ALSO TYPE "HELP <COMMAND>." WHERE<COMMAND> IS ANY VALID KMS COMMAND. REMEMBER TO ENTER EACH ANSWER/COMMAND WITH A PERIOD.

READY FOR COMMAND:

HELP ANSWER.

TO ANSWER MULTIPLE-CHOICE QUESTIONS,ENTER A SINGLE NUMBER DESIGNATING YOUR ANSWER FOLLOWED BY A PERIOD. FOR EXAMPLE,

2.

WOULD BE APPROPRIATE. TO ANSWER NON-MULTIPLE-CHOICE QUESTIONS, TYPE IN A NUMBER WHICH WILL BE YOUR ANSWER,FOLLOWED BY A PERIOD. YOU CAN ALWAYS ANSWER ANY QUESTION WITH "UNKNOWN." A PERIOD MUST ALWAYS END ANYTHING TYPED INTO KMS.

A COMMAND CAN BE ENTERED WHENEVER KMS HAS ASKED YOU A QUESTION. THIS WILL CAUSE KMS TO SET ASIDE ITS QUESTIONS, FOLLOW YOUR COMMAND, AND THEN ASK YOU FOR FURTHER COMMANDS. TYPE IN "CONTINUE." WHEN YOU WANT TO RETURN TO ANSWER KMS'S PREVIOUS QUESTION. IF YOU NEED MORE HELP,YOU CAN ALWAYS TYPE IN "HELP." AT ANY TIME,OR REFER TO THE KMS MANUAL.

READY FOR COMMAND:

DISPLAY DEFINITION(DEMAND ON SUBJECT).

```
COMMAND ENCOUNTERED- DEFERRING CURRENT QUESTION.

IF  THE DEMAND ON THE SUBJECT IS MINIMAL (FOR EXAMPLE,
PROPER USE OF  CHILD  RESISTANT  MEDICINE  CONTAINER),
THEN  DEMAND  IS  LOW.   IF THE SUBJECT IS REQUIRED TO
CHANGE A LONG STANDING HABIT, THEN THE DEMAND IS HIGH.

READY FOR COMMAND:

CONTINUE.

CONTINUING PREVIOUS LINE OF QUESTIONING

DEMAND ON SUBJECT:
(1) HIGH
(2) LOW
=?
1.

TYPE OF TREATMENT:
(1) EDUCATIONAL
(2) MEDIA
(3) TECHNOLOGICAL
(4) OTHER
=?

7.

7   IS  AN INAPPROPRIATE ANSWER
ANSWER IGNORED - TYPE 'HELP ANSWER.' IF YOU NEED HELP.

=?
1.

TYPE OF OUTCOME MEASURE:
(1) KNOWLEDGE OR ATTITUDE
(2) BEHAVIOR
(3) PHYSICAL HEALTH
=?
3.

BASED  ON  YOUR  DESCRIPTION,THE  FOLLOWING  ARE  THE
PROBABILITIES OF OBTAINING NEGLIGIBLE,MEDIUM,AND  HIGH
BENEFIT FROM THE PROJECT.

  HIGH : 0.85
  MEDIUM : 0.15
  NEGLIGIBLE : 0.00

THANKS FOR USING THIS SYSTEM. TYPE 'NEXT CASE.' IF YOU
WANT  TO  ANALYSE ANOTHER PREVENTION PROGRAM OR IF YOU
WANT TO SEE THE EFFECTS OF CHANGING  YOUR  DESCRIPTION
OF THE PREVIOUS CASE.
IF YOU WANT TO STOP, JUST TYPE 'STOP.'

READY FOR COMMAND:

NEXT CASE.
```

READY FOR NEXT CASE

PROBLEM ADDRESSED BY TREATMENT:

.
.
.

Note the provisions for help as well as error handling when the user responds with an invalid input. In addition the user can request definitions as needed (a single definition is implemented in the prototype) and can answer 'unknown' to any prompt.

The decision maker describes the proposed policy by answering the prompts. When the last feature of the policy has been described, the DSS calculates the probability that the impact of the policy will be negligible,medium, or high. Recall that as described earlier, "negligible" corresponds to the situation in which the average person who has received the policy is better off than no more than 65 per cent of those who have not. "Medium" corresponds to the case in which the average person in the experimental group which received the policy is better off than between 66 per cent and 84 per cent of the control group. "High" corresponds to the case in which the average person in the experimental group is better off than more than 85 per cent of persons who did not receive the policy.

If the decision maker enters 'next case' after seeing the predicted impact, then the DSS erases her previous responses and again prompts her to describe a different policy or a different version of the policy under consideration. The cycle continues until the decision maker enters 'stop'.

5. Conclusions

Initial testing of the DSS revealed that users found the DSS very easy to learn and very easy to work with. The results were easily understood. Users did request more studies be included in the knowledge base. Also, they wanted more variables and more categories within variables. These requests are being acted on: 83 additional studies have been coded and are being processed for inclusion in the next version of the DSS.

Approximately four person-days were required by the first author to learn KMS and to bring up the prototype DSS using KMS. By contrast approximately five times the effort (20 days) was required to construct a less challenging DSS using a lower level language, Superwylbur Macros. The great difference in time and effort is directly attributable to the following features of KMS:

. a built in,robust user interface which saved

not only time but difficult trade-offs between accommodating users versus saving development time;

. A built in statistical estimation procedure which reduced the amount of code to be written and obviated the need for interfacing with an outside statistical routine.

As construction of the prototype drew to a close, it became evident that the KMS should be used to construct a DSS to help in calculating effect sizes from the remaining studies. Glass et al. [1] provide some 15 formulas for estimating the effect size based on different sets of statistical results which researchers commonly furnish. Deciding which formula to apply and then making the required calculations is often complex and error prone. KMS supports both rule based deduction (characterized by if-then logic) and calculations. There is,therefore, considerable potential for saving time and improving the accuracy of the findings by writing another DSS, not for the end user, but for the DSS producer. This DSS will prompt whatever set of statistical results the researcher reported and either calculate the effect size or indicate that based on the inputs furnished, no effect size can be calculated. See [6] for examples of KMS production systems and KMS calculation features.

Furthermore, the speed and reliablity of coding of the studies can be improved by constructing a DSS for coders which will prompt them for features of studies and use production system logic to develop higher level inferences such as the type of experimental design used.

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Appendix: Knowledge Base

```
ATTACHMENTS: DEFINITION %
ATTRIBUTES:
PROBLEM ADDRESSED BY TREATMENT: SUBSTANCE ABUSE,
   ACCIDENTS,
   PHYSICAL HEALTH,
   MENTAL HEALTH,
DEMAND ON SUBJECT
[DEFINITION:
"IF  THE  DEMAND  ON  THE  SUBJECT  IS  MINIMAL  (FOR
EXAMPLE,PROPER USE OF
CHILD  RESISTANT  MEDICINE CONTAINER), THEN DEMAND IS
LOW. IF THE SUBJECT IS REQUIRED  TO  CHANGE  A  LONG
STANDING  HABIT,THEN  THE  DEMAND  ON THE SUBJECT IS
HIGH."] : HIGH,LOW.
 TYPE OF TREATMENT: EDUCATIONAL,
   MEDIA,
   TECHNOLOGICAL,
   OTHER.
TYPE OF OUTCOME MEASURE:
  KNOWLEDGE OR ATTITUDE,
  BEHAVIOR,
  PHYSICAL HEALTH.
POTENTIAL BENEFIT [DETERMINANTS: * ] :
 NEGLIGIBLE <0.36>
  0.29 0.24 0.06 0.41;
  0.24 0.76;
  0.24 0.29 0.12 0.35;
  0.29 0.71 0.00,
 MEDIUM <0.32>
  0.53 0.20 0.27 0.00;
  0.20 0.80;
  0.47 0.07 0.00 0.46;
  0.47 0.33 0.20,
 HIGH <0.32>
  0.00 0.47 0.33 0.20;
  0.87 0.13;
  0.07 0.20 0.47 0.26;
```

```
  0.00 0.27 0.73 %
ACTIONS:
 MESSAGE " "
"THIS  SYSTEM  CLASSIFIES PROPOSED PREVENTION PROGRAMS
BY  ESTIMATING  THE  PROBABILITY  THAT  THEY  WILL
PRODUCE  EITHER  NEGLIGIBLE OR  MEDIUM  OR  HIGH
BENEFITS. TO GET THE SYSTEM TO ESTIMATE THE BENEFITS
OF  A  PROGRAM,  ANSWER  THE  FOLLOWING  QUESTIONS.
ANSWER  'UNKNOWN.' IF YOU CANNOT SUPPLY AN ANSWER TO
A QUESTION."
"NOTE:  THIS  SYSTEM  IS  FOR  DEMONSTRATION  PURPOSES
ONLY!"
  "TYPE 'CONTINUE.' TO BEGIN" .
  PAUSE.
  MARK.
   OBTAIN POTENTIAL BENEFIT.
   MESSAGE " "
  "BASED ON YOUR DESCRIPTION, THE FOLLOWING ARE THE "
  "PROBABILITIES OF OBTAINING NEGLIGIBLE,MEDIUM,AND"
  "HIGH BENEFIT FROM THE PROJECT." .
    DISPLAY VALUE (POTENTIAL BENEFIT).
 MESSAGE " "
"THANKS FOR USING THIS SYSTEM. TYPE 'NEXT CASE.'IF YOU
WANT TO ANALYSE ANOTHER PREVENTION PROGRAM OR IF YOU
WANT TO SEE THE EFFECTS OF CHANGING YOUR DESCRIPTION
OF THE PREVIOUS CASE. IF YOU WANT TO STOP, JUST TYPE
'STOP.' " %
```

APPENDIX B
Identifying and Locating Studies

IDENTIFYING AND LOCATING STUDIES

The search for the 100 studies that were to be included in the meta-analysis began in earnest after the inclusion/exclusion criteria were established. As the collection process got underway it soon became evident that some studies that might have been useful simply could not be obtained. This was periodically the case despite multiple attempts to locate specific studies. Despite this recurring problem, however, 100 varied studies were located and coded.

A variety of sources were used to both identify titles of potential studies and to actually locate the studies themselves. Computer searches (such as Medlars, National Institute on Alcohol Abuse and Alcoholism (NIAAA),Smithsonian Science Information Exchange and Defense Technology Information Service); card catalogues; recommendations by professionals in the field, Department of Transportation (DOT) staff, consultants, and Creative Associates staff; bibliographies; social science/psychological indexes; medical/professional/ speciality journals; special publications; and government agencies were used to generate lists of potentially useful studies.

When using computer services, bibliographies and card catalogues key descriptors were used to focus the search. The primary descriptors used were: Primary Prevention, Prevention, Alcohol, Alcoholism, Driving, Drinking, Accidents, Smoking, Substance Abuse, Injury, Poisoning, Experimental, Controlled, and Treatment.

As possible titles were identified, the following libraries were used for the actual collection of the studies: The National Library of Medicine, NIAAA, National Institute of Mental Health, Public Health Service, Occupational Safety and Health Administration, George Washington University, Georgetown University, American University, and Howard University. These libraries also served as access points to card catalogues and computer services.

DOT staff and contractors served as additional sources of studies, particularly of unpublished materials.

As studies were identified and located, they were briefly evaluated by project staff to determine their appropriateness for inclusion in the meta-analysis. Studies, journals, articles, and publications that were rejected for the analysis were, however, used as sources for other studies.

From the beginning of the collection process, an attempt was made to obtain studies that dealt with a variety of subject areas. As the number of studies neared 100, efforts were increased to identify and locate studies in subject areas that were under-represented or not represented at all. For example, toward the end of the collection process, studies dealing with the

prevention of litter and heat stroke took precedence over additional studies on the prevention of smoking.

Obviously, the studies used in this analysis do not include every experimental or controlled study ever completed. They do, however, represent the most significant studies available and a broad cross-section of the different subject areas in which primary prevention research has been attempted.

APPENDIX C
Studies Coded for Use in the Meta-Analysis

STUDIES CODED FOR USE IN THE META-ANALYSIS

Axelsson, Per et al. "Effect of Fluoride on Gingivitis and Dental Caries in a Preventive Program Based on Plague Control." Community Dental Oral Epidemiology. 1975, Vol. 3, pp. 156-160.

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Botvin, G.J. et al. "Reducing Adolescent Obesity Through a School Health Program." Journal of Pediatrics. December 1979, Vol. 95, No. 6.

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*Asterisk denotes studies that were used in the meta-analysis.

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APPENDIX D
Codebook

03/23/82

PRIMARY PREVENTION META-ANALYSIS

CODEBOOK

Item	Definition and Criteria	Coding Categories
1. Coder ID 01	Coder's Name	1. SK - Sue Korenbaum 2. KS - Kay Shaw 3. WP - Wayne Pawlowski 4. SO - Sid Obot 5. KD - Kay Drews 6. TN - Tom Nagy 7. JS - Jim Star
2. Study ID 02 03 04	Three-digit number assigned sequentially by Project Director.	001 to 199

Item	Definition and Criteria	Coding Categories
3. Author(s) 05 to 16 , 17 18	First 12 letters of last name (left justify) and first initial of first author listed on document. If more than one author listed, indicate multiple and if only one author is listed, indicate single.	NAME: _____ 1. Single 2. Multiple
4. First affiliation of first author. 19 20	Indicate type of institution author was affiliated with at the time of completion of document. Specify if other.	01. University 02. Federal Gov't Agency 03. State Gov't Agency 04. Local Gov't Agency 05. Medical Hospital 06. Mental Health Facility 07. Private Foundation/Grant Funding Organization

Item	Definition and Criteria	Coding Categories
4. Con't		08. Non-Profit Organization, (includes United Way) other than above 09. Proprietory firm, other than above 10. International Agency or Organization (non-country specific) 11. Foreign Gov't 12. Not Specified 13. Other _____
5. Degree of first author. 21 22	Academic degree. Specify if other. Assume M.D. if not specified and organizational	01. Ph.D. 02. DSW

Item	Definition and Criteria	Coding Categories
5. Con' t	affiliation, work setting, and/or the nature of the study suggests a medical environment. Otherwise make no assumptions and code "not specified." Post-Graduate degrees are Ph.D., MD, JD, & ED.	03. DR.P.H 04. M.D. 05. J.D. 06. Ed.D. 07. M.S./M.A. 08. MSW/ACSW 09. R.N. 10. B.S./B.A. 11. More than one post-graduate degree 12. Other 13. Not Specified

Item	Definition and Criteria	Coding Categories
6. Publication Date 23 24 25	Year of document (last two years). If coding from more than one document, use most recent date and indicate multiple or single.	_____ 1. Single 2. Multiple
7. Publication Form 26	Source of document. Use "unpublished" only if a unpublished document serves as the primary source of data. "Other" includes gov't published and unpublished documents such as final reports, project summaries, etc.	1. Journal 2. Book 3. Dissertation/Thesis 4. Unpublished 5. Other
8. Subject of Study 27 28	Indicate the problem that was addressed by the prevention or intervention strategy (use author's language whenever possible) or the behavior that the study tried to change. Specify if other.	01. Alcoholisim 02. Alcohol Abuse/Problem Drinking 03. Alcohol Use 04. Alcohol Abuse and Other Drug Abuse

Item	Definition and Criteria	Coding Categories
8. Con't		05. Alcohol Use and Other Drug Use
		06. DWI
		07. DUI
		08. Drinking Driver
		09. Drug Abuse or Substance Abuse
		10. Drug Use or Substance Use
		11. Tobacco Smoking
		12. Tobacco Smoking and Other Drug Use
		13. Traffic Accidents
		14. Accidental Poisoning
		15. Other Accidents
		16. Cancer

Item	Definition and Criteria	Coding Categories
8. Con't		17. Hypertension 18. High Blood Pressure 19. Heart Attack 20. Disruptive Behavior or Delinquency 23. Two or More of Above 24. Other _____
9. Funding Agency 29 30 31	Indicate source of primary financial support for the study. If more than one, indicate multiple. If largest source is unknown or unclear, indicate first source listed.	01. NHTSA 02. NIH 03. NIMH 04. ADAMHA 05. NIDA 06. NIAAA

Item	Definition and Criteria	Coding Categories
9. Con't		07. Federal-Other
		08. State Gov't
		09. Local Gov't
		10. Private Foundation/Grant Funding Organization
		11. Non-Profit Group (includes United Way)
		12. University
		13. International Agency or organization (non-country specific)
		14. Special Interest Group
		15. Other
		16. Not Specified

Item	Definition and Criteria	Coding Categories
9. Con' t		0. Not Specified 1. Single 2. Multiple
II. MILIEU		
10. Geographic Locale 32	Indicate the type of locale where the study was actually conducted.	1. Urban 2. Urban-Suburban 3. Suburban 4. Suburban-Rural 5. Rural 6. More than one of the above 7. Not Specified (or cannot be determined)

Item	Definition and Criteria	Coding Categories
11. Setting of the Study 33 34	Indicate the environment where the treatment was administered as specified by the author. If medication is administered, code "home" unless otherwise specified. Specify if other.	01. Home 02. School 03. Place of Work 04. Medical Clinic 05. Hospital 06. Mental Health Center 07. Other Public Facility 08. More than one of the above 09. Other 10. Not Specified
12. Start Date of the Study 35 36	Year study began (use last two digits). If not specified, use the period data was collected for as the start date.	Year _____ 01. Not specified

Item	Definition and Criteria	Coding Categories
13. Length of Study 37	Indicate the total length of time during which all study related activities occurred (include follow-up time if it occurred within one year or less after treatment.)	1. Less than six months 2. Six months to a year 3. 1-2 years 4. 2-3 years 5. 4 years or more 6. Not Specified
V. CHARACTERISTICS OF SUBJECTS		
14. Age 38 39	Age of subjects. If the age(s) of subjects can be estimated from other information reported in study, code for appropriate category and note how estimations were made on code sheet.	01. Birth to 5 or Preschool 02. 6-11 or Primary School 03. 12-14 or Middle School 04. 15-18 or High School 05. 19-25 or Undergraduate 06. 26-30

Item	Definition and Criteria	Coding Categories
14. Con't		07. 31-45 08. 45-60 09. 61 and over 10. Two or more of the above age groups 11. Not Specified
15. Number of Males 40 41 42	Total number of males subjects (put in leading zeros if less 100). 000 = no males 998 = unspecified 999 = more than 998	_____

Item	Definition and Criteria	Coding Categories
16. Number of Females 43 44 45	Total number of female subjects (put in leading zeros if less than 100). 000 = no females 998 = unspecified 999 = more than 998	_____
17. Race 46	Describe the primary racial groups. Indicate the name of the country of non U.S. subjects. If sample is randomly selected from a special population (i.e., veterans, H.S. students etc.) the sample is not a random sample. Use "mixture of above" only if more than one race is specifically mentioned in study. Use "not specified" if absolutely no racial demographics are given even if assumptions	1. Black 2. White 3. Hispanic 4. Native American 5. Asian 6. Mixture of above 7. No Targeted Racial Group (Random Sample)

Item	Definition and Criteria	Coding Categories
17. Con' t	can be made about the demographics of the sample.	8. Non-U.S. 9. Not Specified
18. Education 47	Describe the highest completed grade or current grade of subjects if they are in school at time of study. If education of subjects can be estimated from other information reported in study, code for appropriate category and note estimations on code sheet. If sample is randomly selected from specific population (i.e., PH.D' s, Doctors etc.) sample is not considered random. Use mixture only if more than one educational level is specifically mentioned in study. Use "not specified" if absolutely no educational demographics are given even if assumptions can be made.	0. Pre-school 1. Grades 1-6 or Grammar School 2. 7-9 or Middle School 3. 10-12 or High School 4. Jr. College 5. College 6. Graduate/Post-Graduate 7. Mixture of above 8. All (random sample) 9. Not Specified

Item	Definition and Criteria	Coding Categories
19. Income Level 48	Describe the income level of the sample population (use author's language whenever possible). If target group is children, indicate income level of parents. If sample is randomly selected from a specific population (i.e., middle class residents) sample is not considered random. Use mixture only if more than one income level is specifically mentioned in the study. Use "not specified" if absolutely no income demographics are reported even if assumptions can be made.	1. Upper 2. Middle 3. Lower 4. Unemployed 5. Retired 6. Mixture of above 7. All (Random Sample) 8. Not Specified

Item	Definition and Criteria	Coding Categories
V. METHODOLOGY		
20. What was the level of effort used to obtain a sample that was "at risk."	Level of effort is determined by the extent to which the author identified and selected a sample that represented an "at risk" or "high risk" group. A sample selected from the general population (identified as not having symptoms of the problem) is considered "no effort"; a sample selected from a population that is identified as having members who may be "at risk" or "high risk" but little effort is made to select these members, is considered "some effort"; and a sample which is comprised of subjects selected from a population that is "at risk" (identified as having the potential of manifesting the symptom if there is	1. No Effort 2. Some Effort 3. High Effort 4. Not Specified

Item	Definition and Criteria	Coding Categories
20. Con't	no intervention) or "high risk" (identified as manifesting some sort of symptom) is considered "high effort."	
21. How were subjects assigned to groups? 50	Indicate the appropriate group assignment method used to divide subjects into treatment and comparison groups.	1. Random 2. Matching/Equivalent Groups 3. Same Group Overtime 4. Convenience Sample 5. Other Non-Random/Non-Matching 6. Not specified
22. How many different treatments were used? 51	Indicate the total number of treatments that were used (does not include placebo). For treatments that may have several components (i.e., group discussion, education and lecture) code as a single treatment. Do not code for individual components. Also, count	_____

Item	Definition and Criteria	Coding Categories
22. Con' t	a treatment only once regardless of how many groups it is administered to.	
23. How many started treatment? 52 53 54	Indicate total number of subjects in <u>all</u> treated groups from beginning to end. (Does not include control.) When study reports only the number of subjects that have completed the treatment, do not assume how many started, code as "unspecified". 000 = 0 998 = unspecified 999 = 998 or more	_____
24. What was the sample size of <u>all</u> control or comparison groups? 55 56 57	Indicate the total number of subjects in all control or comparison groups. (If the comparison group also serves as the treated group use the size of the post-	_____

Item	Definition and Criteria	Coding Categories
24. Con' t	test group.) 000 = 0 998 = unspecified 999 = 998 or more	
25. How many subjects completed? the treatment? 58 59 60	Indicate how many subjects succesfully completed the treatment as defined by the study. Does not include control and/or placebo. 000 = 0 998 = unspecified 999 = 998 or more	_____
26. How many subjects were available for follow-up? 61 62 63	Indicate the number of subjects that were available for follow up (includes control). The first post-test is not considered the follow-up if it is	_____

Item	Definition and Criteria	Coding Categories
26. Con' t	given within one year after treatment was administered. Follow-up is considered any test after the post-test or in the case of a time series the last test reported. 000 = 0/No follow-up 998 = unspecified 999 = 998 or more	
27. Research Design 64 65	Describe the measurement schedule including the length of time between tests. (Code the design that best fits the measurement schedule as described in document. For projects that may involve several designs select the design that is the best description of the overall design of the project.)	01. Pre-Test/Post-Test Control Group. 02. Pre-Test/Post-Test Control Group with an Additional Control Group, Post Test only.

Item	Definition and Criteria	Coding Categories
27. Con't		03. Post-Test-only Control 04. Factorially Organized, Pre-Post Controlled. 05. Factorially Organized, Repeated Measurements Controlled. 06. Time-Series Analyses With Equivalent Control 07. Time-Series with Same Group Over Time. 08. Time-Series with Non-Equivalent Control Group.. 09. One-Group Pre-Test/Post-Test. 10. Non-Equivalent Control Group, Pre-Test/Post-Test.

Item	Definition and Criteria	Coding Categories
27. Con' t		11. Other _____
		12. Not Specified.
28. Duration of Treatment	Describe the length of time over which treatment was administered and the frequency with which it was delivered. This is intended to be a measure of the intensity of treatment not of the length of the study. A long period of time would be considered one year or more. A short period of time would be less than one year. Frequent contacts would be at least once every two weeks. Infrequent would be less than once every two weeks. When the length of exposure to treatment does not literally correspond to one of the coding categories, code for category	1. Spread out over a long period of time with frequent contact.
		2. Spread out over a long period of time with infrequent contacts.
		3. Spread over a short period of time with frequent contacts.
		4. Spread over a short period of time with frequent contacts.
		5. Not Specified.

Item	Definition and Criteria	Coding Categories
28. Con' t	that most accurately reflects the intensity of the treatment.	
VI. CHARACTERISTICS OF TREATMENT		
29. What were the treatment characteristics for Group #1? 67 68 69 70 71 72 73	Indicate the type of treatment used (select no more than three treatment categories) and the extent to which the treatment was active or passive. If less than 3 categories, use "no item" for remaining code columns. If control group was used always code Group #1 for the control and regardless of number of controls used, code for the control group only once. If there are different applications for one type of treatment per group, each application should be coded as a separate treatment (i.e., if two	00. No Item 01. Educational (includes lectures) 02. Informational/Advertising 03. Technological 04. Pharmacological 05. Legal 06. Non-Therapy Group Process 07. Psychotherapy 08. Recreational 09. Vocational Training

Item	Definition and Criteria	Coding Categories
29. Con't	different type of drugs are used, code pharmacological twice). However, if a treatment has many components as is frequently the case with educational programs (e.g. lectures, group discussion, distribution of materials), code the treatment only once and not its components.	10. Control 11. Other _____ 12. Placebo
	Treatments which require the host (subject) to adopt a new behavior to a problem (i.e., boiling water) are "purely active". Treatment which focus on altering the agent or environment to prevent the problem (i.e., chlorinating the water) are "purely passive". A treatment is "more passive than active" when it requires a minimal change in behavior or builds on an	1. Purely Active 2. Purely Passive 3. More Active than Passive 4. More passive than active 5. Control 6. Unspecified

Item	Definition and Criteria	Coding Categories
29. Con' t	existing behavior (i.e., taking medication to reduce the risk of an illness); and "more active than passive" if it requires the subject to adopt a new behavior to implement a passive treatment (i.e., buckling seat belts). The key for coding for activity or passivity of treatment is to decide if it is purely active, purely passive or in between. When coding for control <u>always</u> code the activity of the treatment as control.	

Item	Definition and Criteria	Coding Categories
30. What were the treatment characteristics for Group # 2? 74 75 76 77 78 79 80	Indicate the type of treatment used and the extent to which the treatment was active or passive. Select no more than three treatment categories. If less than three treatments were used, indicate "no item" in remaining columns. If there were less than two treatment groups used in this study, indicate "no group" for first two columns and "no item" for remaining columns. Identify on coding sheet which treatment groups correspond with which item number.	00. No Item 01. Educational 02. Informational/Advertising 03. Technological 04. Pharamacological 05. Legal 06. Non-Therapy Group Process 07. Psychotherapy 08. Recreational 09. Vocational 10. No Group 11. Other _____ 12. Placebo

Item	Definition and Criteria	Coding Categories
30. Con' t		1. Purely Active
		2. Purely Passive
		3. More Active than Passive
		4. More Passive than Active
		5. No Group
		6. Not Specified
31. What were the treatment characteristics for Group #3?	Indicate the type of treatment used and the extent to which the treatment was active or passive.	00. No Item
81 82	Select no more than three treatment categories. If	01. Educational
83 84	less than three treatments were used, indicate "no	02. Informational/Advertising
85 86	item" in remaining columns. If there were less than	03. Technological
87	three treatment groups used in this study, indicate	04. Pharmacological
	"no group" for first two columns and "no item" for	05. Legal
		06. Non-Therapy Group Process

Item	Definition and Criteria	Coding Categories
31. Con't	remaining columns. Identify on coding sheet which treatment groups corresponds with which item number.	07. Psychotherapy 08. Recreational 09. Vocational 10. No Group 11. Other _____ 12. Placebo 1. Purely Active 2. Purely Passive 3. More Active than Passive 4. More Passive than Active 5. No Group 6. Not Specified

Item	Definition and Criteria	Coding Categories
32. What were the treatment characteristics for Group #4? 88 89 90 91 92 93 94	Indicate the type of treatment used and the extent to which the treatment was active or passive. Select no more than three treatment categories. if less than three treatments were used, indicate "no item" in remaining columns. If there were less than four treatment groups used in this study, indicate "no group" for first two columns and "no item" for remaining columns. Identify on coding sheet which treatment groups corresponds with which item number.	00. No Item 01. Educational 02. Informational/Advertising 03. Technological 04. Pharmacological 05. Legal 06. Non-Therapy Group Process 07. Psychotherapy 08. Recreational 09. Vocational 10. No Group 11. Other _____ 12. Placebo

Item	Definition and Criteria	Coding Categories
32. Con' t		1. Purely Active
		2. Purely Passive
		3. More Active than Passive
		4. More Passive than Active
		5. No Group
		6. Unspecified
33. What were the treatment characteristics for Group #5? 95 96 97 98 99 100 101	Indicate the type of treatment used and the extent to which the treatment was active or passive. Select no more than three treatment categories. If less than three treatments were used, indicate "no item" in remaining columns. If there were less than five treatment groups used in this study, indicate "no group" for first two columns and "no item" for	00. No Item 01. Educational 02. Informational/Advertising 03. Technological 04. Pharmacological 05. Legal 06. Non-Therapy Group Process

Item	Definition and Criteria	Coding Categories
33. Con' t	remaining columns. Identify on coding sheet which treatment groups corresponds with which item number.	07. Psychotherapy 08. Recreational 09. Vocational 10. No Group 11. Other _____ 12. Placebo 1. Purely Active 2. Purely Passive 3. More Active than Passive 4. More Passive than Active 5. No Group 6. Not Specified

Item	Definition and Criteria	Coding Categories
34. Were there more than four (4) treatment groups? T02	Indicate yes if there were more than four treatment groups.	1. Yes 2. No
35. What were the outcome measures of the treatment? T03 T04 T05	Indicate the outcomes that were measured. Select no more than three outcome measures. Indicate "0" in remaining columns if less than three outcome measures were indicated. Physical condition includes "accidents" and injuries. Note on code sheet the operational definition of each treatment outcome measure identified (i.e., knowledge = reading ability). Also, note on code sheet if there are more than three outcomes but it is not necessary to stipulate what they are.	0. No Item 1. Knowledge 2. Attitudes 3. Behavior 4. Physical Condition 5. Mortality 6. Change in Natural Environment 7. Change in Man-Made Environment

Item	Definition and Criteria	Coding Categories
36. How were the treatment outcomes measured? T06 T07	Describe the measurement methods used to capture the outcome variables. Code for categories that have reported results. (Check one category only.)	01. Interviews/Self-Ratings 02. Direct Observation/Obstructive 03. Direct Observation/ Unobstructive 04. Other Unobstructive Methods other than Direct Observation 05. Questionnaires 06. Record Review 07. Knowledge Testing 08. Physiological Testing 09. Psychological Testing 10. Combination of Methods (Specify)

Item	Definition and Criteria	Coding Categories
36. Con' t		11. Other _____
		12. Not Specified
37. How were the testers able to determine to what extent the subjects received the treatment?	Describe how testers were able to measure that the treatment was given, or, if treatment was self-administered, that the treatment was taken. Study must explicitly state that provisions were made to verify or measure that subjects received the treatment as scheduled.	1. Self-Administered Test/ Questionnaires
		2. Experimenter Administered/Test Questionnaires
		3. Physiological Tests
		4. Record Review
		5. Personal Interviews
		6. Observation
		7. Combination of Methods
		8. Other _____
		9. No Provision was indicated.