Using Linked Meta-Analysis To Build Policy Models

Mark W. Lipsey

There are many readily identifiable applications of meta-analysis to the area of drug abuse prevention and related topics. Meta-analysis of preventive intervention research (e.g., Tobler 1986), for instance, can identify more and less effective approaches, as can an analogous meta-analysis of rehabilitative treatment research. Meta-analysis of the correlates of intervention-induced change can illuminate the psychological processes involved in the response to intervention. Meta-analysis of the predictive relationships of risk variables with subsequent abuse can indicate which types of variables are most strongly related to the target behavior and chart the developmental course of drug abuse problems (cf. Loeber and Dishion (1987) on antisocial behavior). Meta-analyses of the relationships among risk factors might better identify their structure and the independent clusters they represent. Meta-analysis of the consequences and correlates of drug abuse can trace the patterns of dysfunction in which abuse is embedded. While each of these individual applications may have considerable merit, the intent here is to look ahead to the prospects of linking a number of such meta-analyses into an integrated whole that covers multiple aspects of problem behavior in a coordinated manner.

It is the purpose of this chapter to sketch a meta-analytic approach to building policy models for certain difficult social problem areas such as drug abuse. The term "policy model" means an interconnected set of statements of relationships that embrace the key variables in the problem (especially those manipulable by social programs or policy), that are descriptively accurate regarding the nature and extent of the problem, that incorporate both predictive/diagnostic risk factors for the problem and the effects of intervention in the problem, and that reflect change over time. Most important, such a model must permit "what if" simulations that yield valid insights into the results of changed risk circumstances, different interventions, and the like.

Meta-analysis offers the potential to integrate the full range of empirical information about a problem into a policy model that may then provide an efficient information base from which to address a number of practical questions in a coordinated manner. To effectively prevent drug abuse, for instance, one must know what risk factors are predictive of subsequent abuse and what interventions may alter those risks. To treat abuse, one must know what range of problems associated with the abuse must be targeted, what treatments are most effective, and how long lasting the effects are. To scale the prevention and treatment effort to the nature of the problem, one must know how widespread abuse and risk for abuse are, how they are distributed in the population, and what trends can be expected in the levels of problem behavior.

There are various identifiable examples of such policy models. In social welfare policy, for instance, rather sophisticated computer simulations have been used to apply different stipulations of government regulations to demographic databases and projections in order to investigate the costs and scope of the different policies (Citro and Hanushek 1991). On other fronts, economists routinely use various forms of economic theory to develop models to explore policy options on a wide range of topics (e.g., markets, labor, housing).

A particularly difficult area for such modeling, however, is presented by social problems that involve a substantial behavioral component and are heavily influenced by personal choices, experiences, and characteristics. Such problems include substance abuse, chronic criminality, domestic violence, school dropout, persistent unemployment, homelessness, and the like. Policy models for these kinds of situations are difficult to develop because the problems are not functions of simple demographics, nor do they lend themselves to analysis in terms of broad economic tenets, incentives, response to law, or other principles of rational behavior. In these areas there are no comprehensive policy models but, rather, various piecemeal models based on the empirical findings of one study or another. Most of these efforts are too limited in scope and have too narrow an empirical base to provide much utility for policy. It is in these difficult problem areas especially that meta-analysis can be used as a tool for integrating empirical findings and contribute to the development of useful policy models. This approach can be illustrated by work underway on antisocial (criminal and delinquent) behavior that is generally applicable to the problem of drug abuse as well.

A DEVELOPMENTAL FRAMEWORK

The focus of this example is on those problem behaviors that can be effectively represented as developmental progressions. This perspective recognizes that there is often a period prior to display of a problem behavior by an individual that may be characterized by the presence of risk factors predictive of the behavior, as well as a period afterwards when the behavior may either go into remission or be established in a persistent, chronic pattern. The early phases of this developmental progression are the appropriate points for any preventive intervention. The later phases are the appropriate points for direct rehabilitative treatment of the problem or, perhaps, supportive treatment to prevent backsliding after the problem is in remission. This framework is most applicable to chronic problems that have distinct precursors in childhood and adolescence. General antisocial behavior can be represented in these terms, as can drug abuse.

To depict this developmental progression in terms of relationships that may be important to a policy model, one must distinguish a variety of elements that can be associated with each other developmentally or concurrently, as described below.

1. *Behavioral progression*. Few problem behaviors represent sharp discontinuities from prior behavior. Typically there are precursor behaviors that share many of the underlying characteristics of the problem behavior. For instance, hyperactivity in early childhood, aggressive behavior in childhood, and criminal violence in adolescence and adulthood are probabilistically linked in a behavioral progression (Loeber 1988). Similarly, abuse of cocaine or heroin is generally preceded by the use of other drugs (Collins 1991). These behavioral progressions have been described as instances of "heterotypic continuity" (Sampson and Laub 1992) to indicate the underlying psychological continuity in what on the surface are different behaviors.

2. *Ancillary problem behaviors*. Serious problem behaviors are rarely manifest in isolation. The problem behaviors themselves cause other problems, as when a person loses employment because of substance abuse. Also, factors that lead to a given problem behavior produce other problem behaviors, as when a person with poor impulse control has problems with delinquency, substance abuse, and personal relationships.

3. *Risk and protective factors*. There is a wide range of variables other than overt precursor or ancillary problem behaviors that are predictive of subsequent problem behaviors. Personal characteristics (e.g., temperament, intelligence), family circumstances (e.g., broken home), nature of peers, socioeconomic status, and many other such factors measured at time 1 can be predictive of problem behavior at time 2. Those that are associated with the emergence of problem behavior are risk variables; those that are associated with less problem behavior than expected at a given risk level are protective variables (Hawkins et al. 1992).

4. *Intervention*. Programs or policies of intervention into the problem behavior cycle can attack the problem behavior itself, ancillary problem behaviors, risk factors, or the social/environmental factors that produce risk. Moreover, they may be preventive interventions that are targeted at the early phases of the developmental progression, rehabilitative interventions during the period when the problem behavior is overt, or maintenance interventions aimed at stabilizing recovery or preventing relapse.

Figure 1 depicts a generic developmental progression in which arbitrary stages of development of the focal problem behavior (e.g., substance abuse, violence) are identified as B_1, B_2, and so forth. The progression of ancillary behavior problems associated with the focal problem is labeled A_1, A_2, and so forth. The risk factors at each stage are identified as R_1, R_2, R_3, and so forth; the potential interventions at each stage are labeled I_1, I_2, and so forth.

Figure 1 represents a generic sketch of a policy model for problem behaviors characterized by a developmental progression. If one had information about the nature and magnitude of all the relationships depicted in that figure, one would have a tool with which to support decisionmaking about appropriate social responses to the problem. For instance, this model and data about the distribution of various early risk factors would be a basis for projecting the extent to which the problem behavior will subsequently develop among a population of interest. Moreover, one could estimate how much the problem behavior might change if the risk factors were to change at different stages, whether naturally or as a result of policy initiatives. Especially important, of course, is the information that this model might provide about the effects of intervention at any stage, and in particular how it might affect the

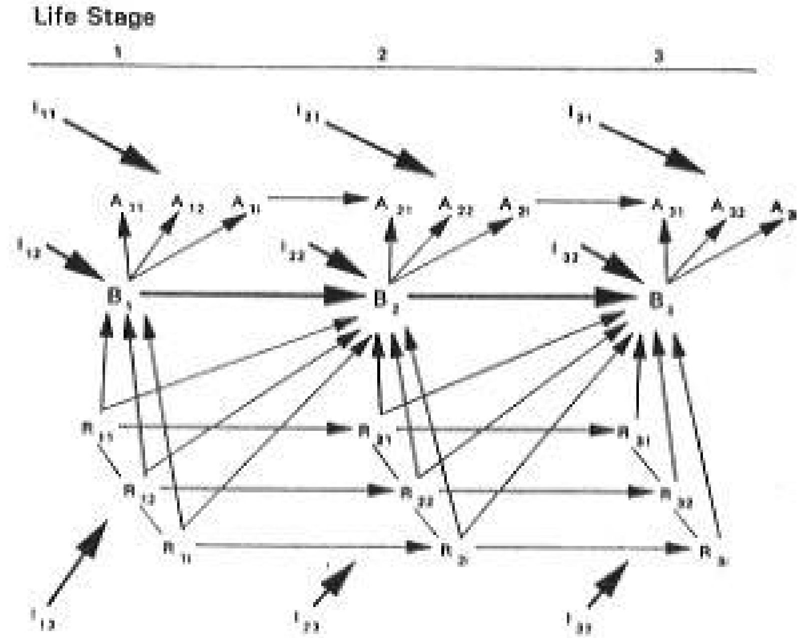

FIGURE 1. *Generic sketch of a policy model for problem behaviors characterized by a developmental progression.*

KEY: I = intervention; B = problem behavior; A = ancillary behavior; R = risk protective factor.

progression of the problem behavior directly and, indirectly, the ancillary problem behaviors.

Is Such a Policy Model Feasible?

It is apparent that, even for a rather simple behavioral problem, a model of the sort shown in figure 1 would be very complex. There are potentially a large number of variables that are relevant, and the information needed is very nearly the relationship of every variable with every other variable at each developmental stage and across all stages. No doubt this complexity is the reason why researchers do not have anything resembling this sort of policy model in the social sciences for many of the troubling social-behavioral problems being studied. Nonetheless, researchers must aspire to as complete an understanding as possible along lines such as these to effectively address the question of how best to ameliorate those problems. One can perhaps draw inspiration from the physical sciences, where it is now not uncommon to model such complex systems as weather patterns.

It is also quite apparent that there are likely to be many more relationships researchers would like to understand than any single study can investigate. Moreover, even if some study were to heroically cover the entire domain of interest, it would have inherent constraints that would make it inappropriate as the sole basis for a policy model. For instance, no matter what samples of persons and sites were involved, there would be some uncertainty about generality to other persons and sites. In addition, the research procedures, construct operationalizations, and even data analysis would represent only limited selections from the set of reasonable approaches. Ideally, one would want to base a policy model on a sufficient sampling of research to ensure some robustness or generality across the methodological and procedural options researchers might exercise and, especially, across the persons, sites, and situations that constitute the domain of the social problem under study.

It follows that the construction of policy models is best approached as a task of research synthesis. Not only does synthesis make use of all the available and relevant research, but it has inherent generality as a function of its integration of multiple studies with all their diversity of methods, samples, and situations (Cook 1993).

Obviously, a synthesis of research bearing on the relationships of interest for a particular policy model is itself limited by the availability of relevant research. There is little likelihood that sufficient research exists in any domain of problem behavior to permit solid meta-analytic estimates of the nature and magnitude of every relationship of interest. For many problem areas, however, there is a corpus of research more than sufficient to permit a start on model development. In addition, one advantage of systematic meta-analysis is that it yields very specific identification of variables and relationships that have not been adequately covered in research and warrant more attention. Development of policy models, therefore, will inevitably be an iterative process in which the quality of the meta-analyses supporting the models will improve as gaps in the primary research are identified and attended to by the research community.

This chapter now takes a closer look at how meta-analysis might be employed to begin the process of constructing useful policy models for social problems reflecting progressions of problem behavior.

Meta-analysis revolves around the effect size, a statistical index of the magnitude of a relationship. The most fully developed procedures are for the product-moment correlation as an effect size index of the degree of association between two variables, and for the standardized difference between means as an effect size index of group differences, whether natural or experimentally induced (Durlak and Lipsey 1991). However, effect sizes in one of these metrics can be algebraically transformed to the other. For present purposes, think of the relationships depicted in the scheme of figure 1 as entirely correlational. This begs the important question of the extent to which certain key relations among them are causal and hence have predictable results when the independent variable is manipulated. This chapter will return to that issue later.

In analyzing the relationships pertinent to the scheme shown in figure 1 for the categorically different types of relationships that must be synthesized in order to give a full accounting of the developmental progression, one finds the following (not all shown in figure 1 to limit clutter).

1. Predictive relationships between a variable measured at time 1 and a variable measured at time 2, representing different stages in the developmental progression:

   BøB relationships
   AøA and AøB relationships
   RøB and RøA relationships
   IøB, IøA, and IøR relationships

2. Cross-sectional relationships between two variables measured at the same time (i.e., during the same stage in the developmental progression):

   AöA relationships
   AöB relationships
   RöR relationships
   RöB and RöA relationships

All of these types of relationships are typically studied and reported in research bearing on the problem behaviors of interest. Longitudinal and panel studies of the problem behavior and, sometimes, of general human development provide information on relevant time 1—time 2 predictive relationships. Cross-sectional surveys and other such studies provide information on the concurrent relationships. Experimental and quasi-experimental investigations provide information on the relationship between an intervention and subsequent outcome variables.

Rarely would all of these types of relationships be investigated in a single study, however. Indeed, experimental studies of intervention, cross-sectional surveys, and longitudinal studies are, for the most part, cate-gorically different research paradigms that study certain subsets of these relationships and almost never examine the other subsets. Meta-analysts typically, and quite reasonably, restrict themselves to synthesizing research in one of these domains (e.g., intervention studies), where comparable issues are investigated with comparable methods across studies.

Constructing a policy model that involves all of the types of relationships shown in figure 1 with meta-analytic techniques, therefore, requires information from multiple meta-analyses—those synthesizing intervention studies, those synthesizing cross-sectional studies, and those synthesizing developmental relationships. Moreover, the natural boundaries of the respective research literatures in these paradigms are likely to be differentiated according to developmental stage. A meta-analyst might, for instance, synthesize intervention research for programs aimed at preventing drug abuse before it begins, but would not necessarily include programs aimed at treating abuse after it is established. Complete coverage of the relationships shown in figure 1, thus, requires something more like a family of meta-analyses than a single one.

Given the natural distinctiveness of the different research paradigms and issues studied within them, and the corresponding distinctiveness of the meta-analyses that would synthesize research within each of those categories, it seems apparent that it will require a set of linked meta-analyses to cover all the relationships relevant to even a simple policy model. But if these research paradigms are distinct, how can the various different research literatures and corresponding meta-analyses be linked into such a model in an integrated manner?

The answer is that such linkage is not possible unless there is substantial overlap among the various research categories in the variables studied. Fortunately, such overlap is relatively common. Intervention studies target as outcome measures much the same problem behavior and risk variables that are of interest to longitudinal and survey researchers. Longitudinal and survey researchers, in turn, often study much the same variables despite their different methods. Moreover, the variables that are of interest at one developmental stage generally overlap those that are of interest at a later stage. By organizing relationships around the key variables of the model, therefore, it should be possible to link information from different literatures and different meta-analytic domains.

The central concept here is the notion of linked meta-analyses—integrating meta-analyses of different but related research literatures via overlapping variables to cover all the relationships needed to synthesize an overall policy model. This policy model will consist of a complex, integrated set of synthesized empirical relationships covering interconnections among the stages of the developmental progression for the problem behaviors, predictive risk factors, and protective factors across those stages, and the effects of intervention at different stages.

Clearly what is envisioned here is a rather complex undertaking, though it builds directly upon existing method and experience in meta-analysis. The remainder of this chapter briefly discusses what seem to be the most important issues that must be resolved in order to proceed along these lines.

CHALLENGING ISSUES

Aside from the sheer complexity of identifying, acquiring, and meta-analyzing all the empirical research relevant to one or another relationship in a policy model of the sort described here, there are some special challenges such an endeavor poses that go beyond current experience and techniques in meta-analysis. Some of the most salient are itemized below.

Punctuating Developmental Stages

Using a developmental framework is central to the version of a policy model proposed here. Organizing information in terms of a developmental progression makes it possible to examine the potential effects of preventive intervention and also gives a basis for projecting likely trends and future problem levels as a function of the frequency and distribution of predictive risk factors. The research base that contributes the most to estimating the nature and magnitude of relationships involved in such a developmental progression consists of studies that investigate the associations between risk or precursor variables at time 1 and problem behavior or subsequent risk at time 2. However, the time 1—time 2 intervals represented in longitudinal research of this sort are likely to vary widely from one study to another. This poses a problem for the meta- analyst of how to organize and aggregate effect sizes representing different intervals covering different portions of the presumed developmental progression.

The most straightforward solution is to divide the developmental progression into different stages indexed to characteristics of the persons moving through those stages. The simplest such characteristic is age for those problems that have childhood precursors and tend to stabilize in chronic form for adults. For aggressive antisocial behavior, for instance, a developmental progression can be charted by dividing the age continuum into segments from birth to adulthood, since there are clear childhood antecedents of aggressive behavior and considerable stability thereafter. For problems like alcoholism that may cycle throughout adulthood, other developmental markers may be needed to segment useful stages (e.g., degree of social impairment).

Once meaningful segments are established, the meta-analyst can categorize any time 1—time 2 effect size according to the stages of the progression represented by times 1 and 2. When times 1 and 2 both fall within a single stage, the relationship can be treated as virtually cross-sectional (perhaps with some statistical adjustment for minor variations in interval length). When times 1 and 2 represent different stages, the corresponding effect size can be aggregated with all like effect sizes that link those same two stages.

Multiplicity of Variables

Nearly all meta-analysis must deal with variability in the operationalization of constructs. This variability requires the meta-analyst to apply some higher order categorization by which certain ranges of operationalizations are judged to represent the same construct while others are judged to represent different constructs. Relationships involving similar constructs under that scheme can be aggregated across studies to produce corresponding effect size estimates. Meta-analysis of relationships for policy models as described here raises this same issue but, because it is likely to involve so many more variables of such diverse sorts, the complexity of the situation is greatly increased.

One approach is to use a hierarchical scheme that first categorizes variables into very broad groups (e.g., personal characteristics, family situation, environmental factors), and then subdivides those groups into smaller, more coherent clusters. Aggregation of effect sizes can then be performed at both broader and narrower levels depending on the amount of detail judged desirable in the policy model. Inevitably there will be variable types in the research literature that are unique or sufficiently infrequent so that no aggregation is possible. Setting standards for the minimum number of effect size estimates necessary for aggregation on any one relationship will likely exclude a large number of peripheral variables and somewhat simplify the meta-analyst's task.

Different Empirical Bases for Different Relationships

Since virtually no research studies are expected to include data on all the relationships pertinent to even a simple policy model of the sort envisioned here, it follows that different relationships in the model will be estimated from different studies. Since those studies are likely to vary in terms of methods, procedures, nature of samples, and the like, a question is raised about whether the different effect size estimates for different relationships will be comparable enough to be included in the same model. Though not well developed in meta-analysis, study comparability is not a new issue; it arises in any synthesis in which effect sizes for more than one categorically different relationship are being estimated (Becker 1992; Premack and Hunter 1988).

With present techniques, there seems to be little that can be done to examine this issue of comparability other than to include as full a range as possible of descriptors of the characteristics of the studies and samples employed in the meta-analysis. Such descriptors allow a side analysis of the extent to which the effect size estimates are functions of study method, procedures, setting, sample characteristics, and other factors (Lipsey 1992). To the extent that such relationships are found, statistical adjustments can be applied to better equate the study findings to be aggregated into effect size estimates for the policy model.

Missing Data, Incomplete Linkages

Even with a focus on only those variables that are most frequently and fully represented in the empirical literature, construction of a full policy model will require synthesis of effect size values for a large number of relationships. Inevitably, the empirical literature eligible for synthesis will not provide even coverage of all those relationships. Some relationships will be widely documented and many studies will contribute to the synthesis; others will not have been examined. In order to move ahead to develop a usable policy model under these circumstances, it will be necessary to fill in the gaps via some imputation or estimation strategy. The critical question is how to go about this.

Several approaches deserve consideration. One possibility would be to estimate the magnitude of underdocumented relationships on the basis of theory, hypothesis, or expert judgment. In this approach, the intuitions of knowledgeable persons, or whatever theory was available or could be developed, would be used to assign an order of magnitude estimate to the missing relationship. Alternatively (or in combination), an empirical technique could be applied (e.g., estimating the magnitude of a relationship between two variables as the mean of the relationship of each of those variables to other "similar" variables). Rubin (1990) has proposed a scheme in which effect sizes might be arrayed along defined dimensions in ways that could permit unmeasured effect sizes to be interpolated. More sophisticated empirical imputation techniques may also be applicable, but only limited work has been done along these lines for missing meta-analysis effect sizes (Pigott 1993).

Whatever the approach applied, it seems clear that any relationships in a policy model that are not derived from directly relevant empirical estimates must be flagged as weak points in the model. Ideally, they would be updated as soon as possible with empirical estimates based on new research designed to fill in the most crucial gaps in the model.

Causality

Many of the questions one would want a policy model to address have to do with cause-and-effect relationships. The most obvious example would be assessment of the likely effects of intervention of a given sort at a given stage on developmental progression. For direct intervention effects, available experimental research can be expected to provide information interpretable in causal terms. Less direct effects (e.g., those on ancillary problem behaviors, long-term effects, and effects on subsequent risk factors not generally studied in intervention research) will not necessarily be described by the available experimental research. However, correlational research may link those variables to outcomes that are represented in the experimental research. The question is how to estimate the indirect causal influences within the constraints of the known correlations.

A similar question is implied when one attempts to use the policy model to estimate the effects of changed risk circumstances. For example, if one wanted to know how much difference a stronger family life would make in adolescent drug abuse (e.g., reduced frequency of single parent families, higher socioeconomic status of families in poverty), one would need to estimate the effects at time 2 of altered risk factors at time 1. Available literature permits synthesis of time 1—time 2 correlations between risk factors and subsequent drug abuse but, for obvious ethical and practical reasons, there is no experimental research to identify the strength of the respective causal relationships.

Therefore, while some direct causal evidence may be gleaned from synthesis of experimental research, especially where intervention issues are involved, many of the causal issues of interest will have to be addressed on the basis of correlational data. This task is much the same as that for which path analysis and structural equation modeling were developed. An important part of constructing a policy model from research synthesis, therefore, will be the estimation and testing of causal influences among variables on the basis of theory and consistency with empirically derived correlations using structural modelling techniques (Becker 1992; Premack and Hunter 1988).

Base Rates and Frequencies

Researchers are often content to learn the nature and magnitude of the relationships among the variables pertinent to an issue. For policy and decisionmaking purposes, however, it is also often necessary to have information on the number of persons involved in a social problem and the number (or proportion) likely to be affected by any ameliorative efforts. Base rate information about the number of persons affected by a problem, or evidencing risk factors for the problem, is generally available from surveys and other such descriptive research. What is needed in addition is some means of interpreting the effect sizes for key relationships that are derived from research synthesis in terms of the number of persons affected when circumstances described by that relationship change. For example, if one knows the effect size for the impact of an intervention on drug abuse and then imagines applying that intervention to all abusers, how much will the number of drug abusers decrease?

The easiest way to represent such situations is with a set of proportions that represent transition probabilities from one state to another. For example, imagine that in a given population 10 percent were drug abusers and 90 percent were not. Say that the mean effect size for an intervention is such that 60 percent of those treated stop using drugs and 40 percent continue and, further, that the effect sizes for risk factors suggest that, of the 90 percent who don't use drugs, 2 percent will begin over the period when treatment is applied to the users. With proportions like these and base rate data for the size of the population at issue, one can estimate the number of persons in each category at any stage of the sequence.

While such proportions are often available in the literature (e.g., in cross-tabulation tables), the correlational and standardized mean difference effect sizes employed in meta-analysis do not capture all the information necessary to reconstruct their values. For purposes of constructing policy models, it would be desirable to synthesize the crucial proportions, where available, in tandem with the customary effect size indices. However, there is a minor technical problem. The meta-analysis literature has not yet adequately addressed the question of synthesizing proportions and other such univariate descriptive statistics (i.e., how to construct weighted means from different estimates, test for homogeneity, determine statistical significance, and the like). Development and explication of such techniques would be useful and should not be difficult.

Costs

Any useful policy model should integrate information on the economic factors associated with the problem situation being modeled. Most important are the costs associated with the problem itself and for the various forms of intervention that ameliorate the problem. Unfortunately for this purpose, the behavioral science research that investigates the developmental progression of behavioral problems, the associated risk factors, and the effects of intervention does not typically include cost variables. While there may be separate economic analyses available for various aspects of these problem situations, they are not necessarily configured in such a way that they can be readily integrated with the behavioral information. A significant challenge for the construction of useful policy models of the sort described here, therefore, is the identification and effective integration of cost factors into the model

Environmental/Social Versus Personal Risk Factors

There is a strong skew in the behavioral science literature toward identifying and measuring variables at the individual (person) level. This means that much of the literature available for synthesis for a policy model expresses risk factors as personal characteristics. However, many risk factors important to a policy model are characteristics of the social conditions and environment with which the persons at risk must cope. Omitting such risk factors from the policy model biases it, on at least some factors, in a victim-blaming direction that implies that the source of the problem is located exclusively in personal deficiencies. Given that the empirical literature itself has this skew, it is not apparent how a policy model based on meta-analysis of that literature can altogether avoid the same skew.

Nonetheless, categorization of risk variables for a policy model should at least attempt to differentiate those that reflect social conditions most directly from those that are inherently more personal (e.g., temperament). For example, socioeconomic status and risk variables involving peers, family structure, and the like are amenable to intervention programs that target social conditions rather than behavior change of individuals. A full model must consider such social intervention and provide some estimate of which risk variables would likely change, and with what results, if the social conditions were changed. Giving fair representation to this dimension of the problems and interventions represented in a policy model presents an important challenge that, at present, has no ready solution.

Implementation of the Model

The basic structure of a policy model as described here is a network of relationships among variables configured so that it is possible to estimate the effects on some variables of changing others. The scope of what is proposed, however, ensures that this network will involve numerous variables and be relatively complex. The question is how one can implement this model in a fashion that will make it useful without compromising its validity (e.g., by oversimplification). Because of the primarily correlational data that provide the empirical base to the model and the causal questions that one would want to ask of it, structural equation modeling would seem to be an appropriate approach to representing the statistical relationships that comprise the policy model.

Structural equation models, however, are not especially accessible or useful for exploring options to those who do not have specialized backgrounds. A better approach might be to use structural equation modeling results and processes as the information base in a dynamic computer simulation of an expert system. Such a simulation could present the user with an interface that depicted the crucial variables, options, and outcomes in readily understandable form. "What if" simulations could then be run to explore the expected effects on problem behavior, costs, and other aspects of changing the risk and/or intervention components in the simulation. Such an implementation of a policy model could, in principle, retain the complexity and detail of the meta-analytic results and relationships derived from the empirical literature, as well as the analytical sophistication of structural equation modeling, while still presenting the problem description, policy options, and expected results in a form that would not require specialized skills to explore or understand. Some such implementation will be necessary if the policy model is to prove useful to the policy and decisionmaking community it is intended to serve.

CONCLUSION

Certainly there are many difficulties with the concept of policy models based on linked meta-analyses. Perhaps the greatest problem, however, is that, even in the best case, developing such a model will require a leap beyond established, detailed knowledge in order to fill in the gaps and make the linkages that are required for the model but inadequately investigated in the extant research literature.

Behavioral scientists are characteristically quite conservative about moving beyond the specifics documented in established research. The level of aggregation inherent to meta-analysis and the likely insufficiencies of available research for portions of a policy model make the approach described here seem ambitious and risky. (Curiously, economists are much less inhibited about these matters, which may explain why they are often more influential in policy domains.)

However, policy and program decisions will be made whether behavioral research is deemed sufficient or not. It is the premise of this chapter that, under such circumstances, decisionmakers should be offered the best available information and, moreover, that it should be systematically synthesized and integrated rather than provided piecemeal. The approach described in this chapter is an attempt to look ahead to how meta-analysis, as an advanced technique of research synthesis, can help build a representation of empirical knowledge that is robust, general, and directly applicable to a range of program and policy issues involving recalcitrant behavioral problems.

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AUTHOR

Mark W. Lipsey, Ph.D.
Professor of Public Policy
Vanderbilt Institute of Public Policy Studies
Box 508, Peabody College
Vanderbilt University
Nashville, TN 37212

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