Tests on A Theory of Risk and Culture

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Introduction

In recent years technological risk has taken a place as a major social problem and as a foci of problem-oriented geographic research (Ziegler, Johnson, and Brunn [24]. The incidents at Three Mile Island (TMI), Bhopal, Chernobyl, and Love Canal, among others, have captured the attention of large numbers of people in both the public at large and in the academy.

In response to such risks, people typically behave differently. And at times they respond differently than they do in comparison to themselves at other times. At issue is the inadequacy of current social theory (Campbell [2]) for the explanation of these differences. In the first place, there is no proven basis from which to correctly identify the factors that can be expected to be statistically relevant to the event-to-be-explained. Moreover, there is no basis for the attribution of cause.

This of course has policy implications. Take for example a point made in the study by Sorensen, *et al.* [19] on the psychosocial impacts of restarting TMI-1. In a discussion of potential mitigation measures they note:

> Since the perception of impacts obviously varies with one's perspective, the adequacy of any mitigation measure to address a given impact will likewise vary.

This may in fact be the case, but until such variation can be explained scientifically, evaluations of mitigation measures are likely to remain highly politicized and occasionally, if not often, even inconsistent.

Douglas and Wildavsky have developed theory which has potential for organizing and understanding risk response if it can be shown to be testable and generally consistent [5]. This paper describes and demonstrates the rudiments of a method which, when refined and developed, could be used as an empirical testing procedure for this theory. As will be discussed, the data in its current form has some critical problems. Hence, its use is more illustrative than purposefully influential.

The primary objective at this point is simply to communicate the rudiments of the approach.

The theory attributes the inconsistencies in individual responses to risk to communal differences in world-views or outlooks, as in Douglas [6]. According to the theory, there are three basic categories of risk salient to this perspective: human violence, economic failure, and technology. The theory holds that a person's choice to rank risks corresponding with each of these three categories is not made directly, but rather is dominantly influenced by social institutions that impact the ways in which events are anticipated. People respond to risks in terms of the institutions through which they view society.

Institutions themselves are interpreted as central or peripheral along a continuum that represents an authority-accepting dimension. In particular, an institution is centrally oriented if it is accepting of the hierarchical structure of American social organization (e.g., the federal government), or else upon its capitalistic basis (e.g., the entrepreneurial spirit). In either case, the language of the theory categorizes that institution as "central," and accords to its adherents certain predispositions with regard to the ranking of types of risk. Those who are influenced principally by center-oriented institutions tend to rank the risks in an explicit, more-or-less definite way. Accordingly, risk from human violence (e.g., war, crime, terrorism) or risk from economic failure (e.g., shortages, unemployment, economic depression) are expected to be held more threatening than risk from technology (e.g., pollution, chemical, or nuclear plant accidents).

Alternatively, if the institutions are more remote from power and influence--for example, protest movements--then they are categorized as "border." The predispositions of those members who orient themselves to the border rank the risks differently; technological risks are expected to be held paramount.

Essentially, then, the theory posits that the ways people select and emphasize risks are decided by their orientations with reference to institutions which locate themselves toward one or the other end of the center vs. border axis.

Testing said theory empirically is very tricky. To take the sort of structural analytic approach suggested here seems to unavoidably involve the rather abstract question as to whether it is possible for there to be terms in a theory whose meanings can be known without knowing the theory and can be the same as those of terms in a different theory. This problem is formally known as "meaning dependence," as in Achinstein [1].

Basically, the problem arises because the theory is an abstraction, expressed fundamentally by language in which words are given arbitrary definitions and ordered according to a grammar that imparts new meaning above and beyond the definitions. In the process of communication and assimilation of the theory, as one mentally reconstructs the logic and anecdotal evidence, one makes inferences combining his own perspective with the suggested logic and evidence of the theory. At root is an unavoidably subjective element involving the assignment of meaning to the grammar and syntax of the language in which the theory is cast. For purposes of science, this subjective element is problematical. So to be prudent in applying the theory in science, something stronger than mere anecdote would seem necessary. This is the point of the paper.

Methods

Survey

A survey was administered to an undergraduate policy class of approximately 200 (predominantly sophomores and juniors) at Indiana University, Bloomington, in March 1987. The purpose of the pilot study was exploratory; its value is intended to lie in the development of experience and suggestion of the protocol for one way of interpreting and giving content to the essentially abstract and conceptual basis of the theory. Such content is required to judge whether or not the theory leads to false conclusions in application.[1]

The survey instrument (see Figure 1) was comprised of sentences informed by the theory. In other words, each item was designed so that a response of "definitely true" suggests an orientation by the respondent toward the "border" end of the center/border axis as set out in the theory. And conversely, a response of "definitely false" suggests an orientation toward the "center." Accordingly, the models were constructed to answer the question as to whether the frequency of confirmatory response renders evidence which is more probable on the theory than would occur otherwise.

Statements A through M comprise the set of independent variables which are designed to measure the set of epistemic definitions, as in

Torgerson [20] that theoretically distinguish between "center" and "border" oriented institutions and their adherents. Epistemic definitions provide a link between the abstract linguistic concepts that appear in the theory and the material behaviors that are evidenced in the actual world. Their content validity is suggested by the theory itself; in other words the items embody a sample of the epistemic definitions taken from the domain of the theory. As mentioned previously, each contains information that would theoretically be "true" for a person oriented toward the theoretical "border."

The final item on the survey, N, is the dependent variable. Its purpose is to rank each respondent's evaluation of three theoretically given policy categories for risk (human violence, economic failure, technology). It should be noted that the initial dependent data were taken in three categories, each with a value between zero and one hundred assigned to it by a respondent. More specifically, the dependent data were initially in a form such that there were three numbers, each ranging in value from zero to one hundred, the sum of the three equalling exactly one hundred. Then for purposes of input into the analysis, much as three dimensional spatial data from the world is collapsed into two dimensional data on a map, so the three categories were reclassified into two categories to demarcate respondents with reference to their orientation along one end or the other of the bipolar center-border axis. This categorization of the data was justified by the logic of the theory. This justification requires further elaboration.

Douglas and Wildavsky state that border type "risk-selectors" tend to view technological risk as the most threatening of the three categories. Conversely, a center type risk selector is theoretically held to rank either risk from economic failure or else risk from human violence as predominant, depending upon whether his culture is primarily influenced by "competitive individualism" or else by "hierarchical collectivism." So if a respondent put all or most of the imaginary hundred million dollars into the category "risk from technology," he would have been classified for the purposes of this study as a border type risk selector. Alternatively, if a respondent put all or most of the imaginary hundred million dollars into either one of the other two categories, or else some combination of both of them that together comprised all or most of the money, he would have been classified as a center type risk selector.[2]

Each respondent's reaction to each of the statements A through M could assume one of five discrete variations, depending upon which of the five possible selections he chose. Given four, the fifth was completely linearly dependent. Thus, only the same four of the five possible variations were included in each of the sub-models; responses that indicated "don't know" were omitted. The few cases in which no response was given, were treated as though they were "don't know" answers.

Models

The data matrix for the set of independent variables was a three-way, respondent x item x response category matrix comprised entirely of ones and zeroes. In each of the three sub-models, different transformations were made on the independent variable data. To describe the submodels, some symbols are required. Let A_{ijk} represent the i^{th} variant response to statement j for student k (i = 1-4, j = 1-13, k = 1-(n = 95)). Specifically, if student k responded "definitely true" to statement j, then $A_{4jk} = 1$ and 0 otherwise. If the response was "mostly true," $A_{3jk} = 1$ and 0 otherwise. If the response was "mostly false," $A_{2jk} = 1$ and 0 otherwise; and if it was "definitely false," $A_{1jk} = 1$ and 0 otherwise. In each case, the value of the transformed variable entering into the analysis was a count, equal to the sum of the associated responses over the entire data set.

One would theoretically expect that groups of respondents with a high frequency of responses of either "definitely true" or else "mostly true" on items A through M, would be of the "border" type. Respondents whose survey sheets fell into this category could theoretically be expected to select technological risk as predominant. In comparison, one would theoretically expect that a group of "center" risk selectors would respond with a relatively high frequency of either "definitely false" or else "mostly false." And accordingly, center type risk selectors might be expected to select either or both risk from economic failure or/and risk from human violence as predominant.

Three stepwise logistic regression submodels were estimated using BMDP, a maximum likelihood routine, as in Dixon [4]. In each case, the dependent variable was a binary variable coded zero (for center) or unity (for border). The predicted proportion of successes (s/n)--in other words the predicted portion of the responses complying to the theoretical expectations--followed the logistic model:

$P(X = x) = \exp(U) / 1 + \exp(U)$,

where s is the sum over the sample of the binary (0,1) dependent variable, n the total sample size, and U a linear function of survey statements A through M.

Submodel M1

This model was estimated using a constant term plus the following two independent variables.

$$X1 = \sum_{i=1}^{2} \sum_{j=1}^{13} \sum_{k=1}^{95} A_{ijk} \text{ and } X2 = \sum_{i=3}^{4} \sum_{j=1}^{13} \sum_{k=1}^{95} A_{ijk}$$

Thus in M1 there were two independent variables. One of them indicated all of the responses that were "true," and the other indicated all of the responses that were "false." Each of the two independent variables in M1 was undifferentiated with respect to either the strength of a given response or else to any statement-by-statement effects. All of the "true" responses were put into one category. And all of the "false" responses were put in another. On this form, the model simply described whether or not the theoretical expectation held true that the responses of "true" lead to a better predictor of selection of technological risk in comparison to responses of "false." This formulation suggests an "overall" test of the theory, without reference to either the strength of response by the student or to the particular statements themselves.

Submodel M2

This was estimated using a constant term plus the following four independent variables:

$$A(i) = \sum_{j=1}^{13} \sum_{k=1}^{95} A_{jk} \qquad i = 1\text{-}4$$

Like M1, this model does not indicate how well particular statements conform to the theory. In other words, one cannot tell from this model what sort of effect the difference between any of the statements A-M might have on the probability of selecting a certain category of risk. Unlike M1 however, this design suggests something of the strength of the respondents' views by considering whether they are "definite" or "mostly" (refer to Figure 1). In other words, M2 provides a basis with which to differentiate between, for example, the effect of "mostly true" and "definitely true" or else between "mostly false" and "definitely false" on the selection of risk. From theory one would hypothetically expect, for example, that those respondents who find any given statement to be "definitely true" might have a greater probability of selecting technological risk as paramount in comparison to those who find the statement to be "mostly true."

Submodel M3

This was estimated using a constant term plus the following fifty-two independent variables:

$$A(i(j)) = \sum_{k=1}^{95} A_k \quad i = 1\text{-}4, \quad j = 1\text{-}13$$

This is essentially a main effects analysis of the variance model. It includes consideration of statement-by-statement effects upon the probability of selecting particular risk categories.

Results

Table 1 presents the results of the analysis of the first two submodels (M1 and M2).

In M1, the coefficient associated with the constant was -.87. The t-value in M1 (-3.88) suggests there is a pattern in the variation in the data accounted for by the constant term. On the other hand, the goodness-of-fit Chi-square value (43.27) suggests that the overall model does not "fit" the data well at all. The negative sign on the constant can be interpreted to indicate what might theoretically be termed a predisposition among the students toward institutions located at the center.

This conclusion requires some explanation. In the general context of regression analysis, the constant term may be interpreted as the mean effect on the dependent variable of all the variables excluded from the model, as in Gujarati [8]. In any case, the constant term is far too complex to interpret as the equation's intercept in the strict mathematical sense, as in Rao and Miller [17]. To some degree, the constant term reflects part of the variation attributable to "don't know" responses. Of course it also partly reflects the effects of other variables that are excluded by misspecification of the model.

The exact relative contribution to the final magnitude of the constant term due to each of the two elements, noted above, must remain uncertain to some extent. But by recognizing that the value of the constant is not fixed per se, but rather could be postulated or at least subjectively thought to have a distribution comprised of the effects of each of these two parts, one might consider the marginal effect of the "don't know" responses, as compared to the other omitted variables, on that distribution. In particular, one might inquire as to the direction of their effect. Of course, the difficulties of interpretation are compounded by the inability to infer anything about the effect of the unspecified variables. Accordingly, all else equal, within the boundaries of the zero to unity interval within which probability values are constrained, one would expect the effect of the contribution of the "don't know" responses to get larger as a function of an increasingly positive constant term. Specifically, the larger the positive constant term, the greater its contribution to the probability that the respondent will select technological risk as paramount. Conversely, the larger the absolute value of a negative constant term, the greater one would expect its contribution to be to the opposite choice. Hence, a positive sign suggests a predisposition toward the border, and a negative sign suggests one toward the center.

Since only the constant term was significant, there is no reason to conclude from M1 that either Douglas and Wildavsky's theory, or any other related theory, is confirmed or rejected relative to each other. Instead, one might best take M1 to be completely indeterminate with respect to the theory.

The results for M2 as compared to M1 suggest a marked improvement of the fit of the overall model (Chi-square = 112.07) through including A(1). A(1) signifies that the "definitely false" category of response conditions the probability that the respondent will select technological risk as predominant, given his characteristic response pattern. The Chi-square value suggests that the model is statistically significant at the .10 level. In M2, the value of the constant decreases to -1.23 (t = -3.90). The t-value is statistically significant, again suggesting for the same reason discussed above both a predisposition on behalf of the respondents toward the "center" and also some misspecification of the model. The estimated coefficient on A(1), 0.35 (t = 1.76), is in the opposite direction than the theory would have predicted. The "definitely false" category should theoretically characterize a respondent inclined toward the center, and so should correlate negatively with an increased probability of selecting technological risk as the paramount one. The fact of this contradiction between the "expected" and "observed" sign on A(1) is not consistent with the structure of the Douglas and Wildavsky theory and so tends to confirm some other unspecified theory relative to theirs. None of the other three variables enter the model.

M3 allows examination of the responses on an item by item basis. All of the items used on the initial survey are included here for purposes of documentation and illustration. The items are shown on a step by step basis as they entered the model in Table 2.

Regarding the general interpretation of the particular values in the table, when a term first enters the model at a given step, its sign does not change throughout the remaining steps. Also, it seems noteworthy that the constant term remains statistically significant throughout all steps. Table 3 shows a summary of the analysis.

Because each of the survey items is written to be "true" for the theoretical border-type risk selector, any term either subscripted with a 1 or 2 and a negative coefficient, or else subscripted with a 3 or 4 and a positive coefficient, is consistent with the structure of the theory and so tends to confirm it relative to the unspecified alternatives. The opposite signs on the values of the coefficients are not consistent with the theory and so tend to confirm the unspecified alternative theories relative to the one at issue.

E(2) was the first term to enter the model in step one, and it entered positively in each step thereafter. Thus, it portends inconsistency for the theory. The issue is voluntariness. According to the theory, the border-type risk selector will suppose that for traditional American values such as liberty to be maintained requires that people volunteer. Of course, the border-type risk selectors addressed by the theory who belong to environmental and protest groups in fact already have volunteered. And the associated respondents here may not have. However, in the main it was probably the realization of the need to volunteer which led those actually involved in such organizations to do so, and not the alternative case in which volunteering led them to realize the need. The difference, though important for purposes of interpretation, is not intrinsically empirical, but rather is experiential.

The small t-value (.44E-06) for E(2) is not statistically significant, so evidently the item itself is not meaningful as an explanatory variable. And evidently due to a combination of multicollinear effects and those associated with decreased degrees of freedom, the overall goodness of fit actually decreases as compared to the constant only. The zero-order correlation between the constant and E(2) is -0.659, which suggests the necessity for adjustment in the presence of multicollinearity, as in Kennedy [11]. However, the t-value is significant at a 95% confidence level in stage one; and as is shown by Table 3, the goodness of fit Chi-square is significant at alpha = 10%, so the model as a whole at this stage seems to describe significant relations.

Thus, the model at step one may be accounting for two things. First, as was the case in M2, it seems to suggest a bias of the respondents toward the center. Again, this is shown by the negative sign on the constant term. Also, the positive sign on the coefficient for E(2) can be taken to mean that there is an increased relative probability of selecting technological risk as predominant among those who perceive less need to volunteer. This may suggest a relatively stronger sense among the border respondents as compared to the center respondents that to volunteer in the face of proliferating technological risk will not suffice to preserve and protect traditional American values; they may suggest that action is required. Then in stage two and throughout the remaining stages, the variable becomes not statistically significant.

The second item to enter is M(4). The item indicates that the students considered it "definitely true" to state that good is good, bad is bad, and the difference in life is normally clear. Except that neither t-value is significant throughout the analysis, the results for M(4) seem to contradict those for the fourth item to enter, M(1). M(1) signifies "definitely false" for the same statement.

Due to their poor showing in terms of their t-values, to consider the broad implications of M(4) and M(1) in general terms is probably not worthwhile. However, partially in consideration of the fact that Table 3 indicates according to the improvement in the Chi-square statistic that both M(4) and M(1) enter significantly into the model, and partially to point out something about the interpretation of this application of these models to avoid possible future errors, a brief point should be made about the type of contradiction they suggest.

This sort of contradiction is possible in this modeling framework because it accounts for the variation in the data according to the rules of its class of models that are themselves based fundamentally upon an element of uncertainty. However the source of this uncertainty can be attributed differently depending upon how the results are interpreted. In any case, the results should not be interpreted in a mechanical manner. Accordingly, this is not a strict logical contradiction in an algebraic sense, but instead is a statistical one. The difference is that there is a fundamental element of uncertainty involved.

This recognition leaves matters a bit more "open." For example, were the results here significant, instead of concluding that the analysis itself was inconsistent--which it was not--they could be interpreted to suggest inconsistency among the students with reference to the sort of polarized value the theory holds to characterize border-type cosmology along this dimension. This suggestion then alludes to further possible insights.

For example, according to Perry [14], such polarized values indicate an earlier stage of development in the college years. Or another interpretation might be based on the work of Kelly [10], which might suggest some confusion on behalf of the group of students with reference to the "permeability" of the ways they tend to make sense of their value systems. By this it is meant that students typically may not have developed the capacity to embrace new elements in their psychological processes, at least insofar as they are ordered along simple dimensions of "good vs. bad."

Table 3 suggests that the likelihood is very small of any of these variables given the data. H(4), which states that concern with the consequences on nature should be one of the first if not the first and main requirement in any public economic decision appears to be the "strongest" explanatory variable. And it enters in conformance with the theory. C(1), which states that the human race will almost certainly soon experience some sort of sudden and drastic change, disaster, or revelation, appears to add very little to the explanatory power of the model. And it enters counter to the theory. The steadily decreasing goodness of fit Chi-Square, which describes the decreased statistical fit of the model as a function of the addition of explanatory variables, is largely attributable to changes associated with degrees of freedom. The steadily increasing p-value suggests that the overall model is accounting for more and more variation in the data, independently of degrees of freedom.

Discussion and Conclusions

In the abstract, few would disagree over basing rules of inductive evidence upon the tenet that observed instances conforming to generalization of the foundations of the theory (T) constitute evidence for it. Moreover, most people would agree that when a given piece of evidence E is more probable given T then given T', then E confirms T more than T'. But for several reasons it is more complicated to thus formulate these rules using the indigenous language of social theory. Complications notwithstanding, a key to a positivist analysis of Douglas and Wildavsky's theory of risk and culture is the ability to translate it in terms of its indigenous "language" into rules of inductive evidence. One of the main reasons for the complication concerns problems of meaning-dependence. Briefly stated, the problem of meaning-dependence is based upon recognition that the indigenous language of the theory cannot be shown to either have or not have meaning which is accurate and adequate for explanation based on logical or mathematical grounds alone. In view of this problem, the format for testing the theory reported in this paper assumes in general that it is possible for there to be terms in a theory whose meanings can be known without knowing the theory. In other words, the terms are transferrable in the sense that such terms have meanings that can be the same as those of terms in a different theory. This assumption makes it possible to further assume that any individual who understands a particular sentence in a survey can correctly and easily decide whether or not the sentence applies to him without reference to inferences based upon theoretical premises.

Regional scientists stand to benefit from refinement of this theory by its addition to the geographical repertoire of theory for use in making scientific explanations for geographic phenomena related to the social processes associated with responses to threat. Accordingly, Douglas and Wildavsky's theory should be treated as one source of several from which to derive alternative hypotheses to use in the process of strong inference, as in Platt [15]. More such theories are needed. But first in keeping with the scientific spirit of geography, before any of them are applied in the discipline, it should be kept in mind, as Popper [16] notes, "it must be possible for an empirical system to be refuted by experience."

At least two further steps are suggested to continue this line of research. First, the survey should be re-administered using refined but similar items, as in Wildavsky [21, 22, 23]. The dependent variable would have to be changed to account for cases in which the respondents do not think that the government should be intervening in such matters. In any case, the instrument would have to be refined to the point at which it would consistently yield data which could meet the statistical independence requirement between measures of "center" and "border" on one hand and measurements of social and institutionally conditioned perspectives corresponding with risk selection patterns on the other. A factor analysis would be useful for purposes of reliability and validity assessment, as in Carmines and Zeller [3]. Also, it would be useful to sample respondents from, for example, public interest research groups on one hand, and national government offices on the other, in order to have data which can be grouped into border and center categories almost by definition. The design of the analysis would then be to predict from which of the two groups an individual comes, given his set of responses.

The basic value of this research seems to be twofold. First, it readily acknowledges the evident social and scientific significance of a theory that can be used to explain social patterns of risk selection. I believe it is very much to their credit that Douglas and Wildavsky's theory can potentially be developed to approach the pressing social problems associated with differential social responses to risk. Furthermore, Douglas and Wildavsky recognize that the classical model of rational man will not suffice for this purpose. On an individual level, none of us stop to estimate the magnitudes of all of the relevant probabilities and negativities associated with each and every risk we face. Certainly, when the compounding complexities of social existence are considered as well, such individual level models are simply not adequate for purposes of social scientific explanation. However, some sort of theory such as this is a logical extension from the assumption that statistical methods are prerequisite for social scientists to explain risk response as an emphatically social phenomenon.

The second value of this research is the fact that it suggests a basic scaling and modeling method which can be used to analyze and refine the structure of the theory in a way that gives substance to its abstractions and concepts. The research in essence suggests a method for moving the theory beyond the realm of a specialized predicate calculus. The basic point is neither to advocate nor to destroy the theory, but rather to treat it in a balanced way, weighing its strong and weak points in light of empirical evidence.

In light of some of the more recent advances in multidimensional scaling that allow for hypothesis tests, such as MacKay [12], more elaborate empirical methods with feasible applications may be possible.

Any such scaling method is likely to depend in large part upon the answer to the rather abstract question as to whether it is possible for there to be terms in a theory whose meanings can be known without knowing the theory and can be the same as those of terms in a different theory. If the answer is affirmative, it seems scaling is possible. And if scaling is possible, then so is empirical testing of the theory through this form of application of logistic regression analysis.

Endnotes

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1. Another way to add content to the theory may be found in the work of Gross and Rayner [7]. However, their method assumes the structure of the Douglas and Wildavsky theory to be correct, and so does not check it for consistency.

2. Though it was clear in the great majority of cases into which category a particular respondent's answers for item N fell, in a few cases this was not so. Therefore, the decision of exactly which individual surveys fell into which if either of the two dependent categories involved some judgment on my part. The key, it seemed, was to judge leniently enough to maximize the sample size for purposes of retaining sufficient degrees of freedom to do the analysis, while still remaining prudently convinced that those included did in fact indicate a definite selection category one way or another. This proved less difficult than initially anticipated. The break points were generally clear, but to make the break points clean for the few cases which required some judgment, the following decision rules were used. Only if

$$N(b) > 1.2 \cdot (N(a)+N(c))$$

were students classified as border-type. Twenty-eight students were of this type. Conversely, only if

$$N(b) < 1.2 \cdot (N(a) + N(c))$$

were they classified as center-type. Sixty-seven students were of this type. The others were discarded.

3. There are numerous people who have helped with this paper. Thanks to Kingsley Haynes, David MacKay, John Odland, Dave Parkhurst, Roger Stough, and Aaron Wildavsky.

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Table 1

Term	Coefficient	Standard Error	Coefficient /S.E.	Chi-square (goodness of fit)
M1				
Constant	-.87	.23	-3.88	43.27
M2				
Constant	-1.24	.32	-3.90	112.07
A1	.35	.20	1.76	

Table 2
M3

Order entered	Term	Coefficient	t
Step 0			
1	constant	-.87	-3.87
Step 1			
1	constant	-1.11	-4.35
2	E(2)	2.66	2.37
Step 2			
1	constant	-.91	-3.67
2	E(2)	10.17	.22
3	M(4)	-17.15	-.25
Step 3			
1	constant	-1.43	-4.44
2	E(2)	15.29	0.03
3	M(4)	-26.75	-0.03
4	F(4)	1.88	3.24
Step 4			
1	constant	-1.32	-4.07
2	E(2)	32.76	-0.00
3	M(4)	-53.33	-0.00
4	F(4)	2.33	3.49
5	M(1)	-10.6	-.16
Step 5			
1	constant	-.155	-4.22
2	E(2)	39.51	0.00
3	M(4)	-63.84	0.00
4	F(4)	2.30	3.36
5	M(1)	-14.33	-.03
6	H(4)	1.28	1.77
Step 6			
1	constant	-1.29	-3.30
2	E(2)	48.4	0.00
3	M(4)	-76.78	0.00
4	F(4)	2.55	3.33
5	M(1)	-18.67	0.00
6	H(4)	1.96	2.12
7	J(4)	-1.21	-1.59

Table 2 (continued)

Order entered	Term	Coefficient	t
Step 7			
1	constant	-1.19	-3.02
2	E(2)	59.65	0.00
3	M(4)	-92.67	0.00
4	F(4)	3.09	3.34
5	M(1)	-23.80	0.00
6	H(4)	2.33	2.34
7	J(4)	-1.67	-1.90
8	C(1)	-3.14	-1.60
Step 8			
1	constant	-1.70	-3.16
2	E(2)	68.04	0.00
3	M(4)	-105.57	0.00
4	F(4)	3.41	3.42
5	M(1)	-28.13	0.00
6	H(4)	2.61	2.54
7	J(4)	-1.77	-2.00
8	C(1)	-4.16	-1.91
9	B(1)	1.11	1.65

Table 3
Summary of Stepwise Results

Term Entered	Log Likelihood	Improvement Chi-square	P-value	Goodness of Fit Chi-square	P-value
constant	-57.60			115.20	.068
E(2)	-53.56	8.087	.004	107.12	.150
M(4)	-47.99	11.13	.001	95.99	.367
F(4)	-42.49	11.00	.001	84.98	.658
M(1)	-38.03	8.91	.003	76.07	.852
H(4)	-36.48	3.11	.078	72.96	.891
J(4)	-35.01	2.94	.087	70.02	.921
C(1)	-33.37	3.29	.070	66.73	.948
B(1)	-31.95	2.83	.092	63.90	.964

Figure 1

This survey inquires about your observations and values concerning various types of risks in today's world. The survey consists of sixteen items. Respond to each of the first fifteen statements DEPENDING UPON WHETHER IT IS TRUE FOR YOU. Remember that all of the answers depend upon your point of view, none of them are right or wrong except as they apply to you.

If the statement is definitely true for you, circle 5.
If the statement is mostly true for you, circle 4.
If you don't know whether it is true or false, circle 3.
If it is mostly false for you, circle 2.
If it is definitely false for you, circle 1.

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
A. The government now regulates too many of the risks people are allowed to take	5	4	3	2	1
B. Some day in the future, human nature can be perfected	5	4	3	2	1
C. The human race will almost certainly soon experience some sort of sudden and drastic change, disaster, or revelation	5	4	3	2	1
D. Man is, for man, the ultimate measure of all human values	5	4	3	2	1
E. For traditional American values such as liberty to be maintained in our nation today requires that people motivate themselves to volunteer to make their convictions known	5	4	3	2	1

F. The increasing use of technology poses a risk to nature which is nothing short of alarming

5 4 3 2 1

G. Deep inside everyone is pure and good

5 4 3 2 1

H. Concern with the consequences on nature should be one of, if not the first, and main requirement in any public economic decision

5 4 3 2 1

I. The ballot box is better than government authority as the basis for public decisions about the risks Americans should be allowed to take

5 4 3 2 1

J. In the management of high risk technology, such as a nuclear power plant, operations must be run purely in conformance with established procedures; that is; compromise with these procedures is never, ever appropriate

5 4 3 2 1

K. One of the first things an insightful imaginary visitor from another planet would be apt to notice about United States' society is that the big government and big industry is basically corrupt

5 4 3 2 1

L. In all things just, lasting, and true, every human being is basically equal

5 4 3 2 1

M. Good is good, bad is bad, and the difference in life is normally clear

5 4 3 2 1

The sixteenth question requires that you fill in the following three blanks

N. If you had $100 million to spend toward solutions to the following three categories of risk, how would you spend it? Assume that you must spend it all. (If you add together all of the numbers you put in the blanks, they should equal 100).

$ ____________M Risks from human violence (for example war, crime, terrorism, etc.)

$ ____________M Risks from technology (for example pollution, transportation, nuclear or chemical accidents, etc.)

$ ____________M Risks from economic failure (shortages, unemployment, inadequate medical care, etc.)

____
$100 million