A New Approach to Explaining Sick-Role Behavior in Low-Income Populations

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Although adherence to medical instructions is usually essential to successful health outcomes, compliance rates (especially in low-income populations) are very inadequate, and little is known about factors influencing such sick-role behaviors. The present study examines the explanatory value of a behavioral model, derived from social psychological theory, and employing health motivations, perceptions, and attitudes of mothers as predictors of compliance with regimens prescribed for their children.

Introduction

Rates of patient cooperation with prescribed medical regimens are often disturbingly low.[1-3] This problem lies within the rubric of sick-role behavior, "activity undertaken by those who consider themselves ill, for the purpose of getting well,"[4] involving both obtaining care and undertaking a multiplicity of dependent behaviors.

Especially dramatic and well documented instances of poor compliance in pediatric *clinic* populations identify a public health concern of considerable magnitude.[5-7] The situation is typified by Bergman and Werner's[8] study of clinic children placed on the 10-day course of penicillin necessitated by streptococcal infections. While about 90 per cent of the parents correctly reported their child's diagnosis and knew the name of the medicine and the proper way to administer it, 56 per cent of the patients were not receiving the medication by the 3rd day; 71 per cent had stopped by the 6th day; and by the 9th day only 18 per cent were still receiving penicillin. Given further qualifications of free medication, physician awareness of the study, and advance notification of families that they would be visited "to see how the child was doing," these disturbing findings probably represent conservative estimates of actual non-compliance in low income populations.

Unfortunately, review of the extensive literature relevant to compliance behavior yields an unsystematic multiplicity of variables which are frequently either not

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predictive of compliance[9,10] or are mutually contradictory.[11] The difficulty stems in part from reliance on a "shotgun" method of selecting variables for study, rather than developing a unified conceptual approach to, or hypothesis about, compliance. Kasl and Cobb[4] note that, in general, studies of reactions to illness have dealt mostly with "superficial demographic and background variables rather than with fundamental, theoretically derived attitudes and subjective perceptions."

The Compliance Model

Underlying Theory

The current research attempts to test empirically a "behavioral" model of compliance, based on social psychological theory[12,13] and relying mainly on motivational and cognitive factors. The model borrows heavily from an existing public health formulation, the "Health Belief Model," constructed to predict "preventive" health behaviors such as obtaining annual checkups, tuberculosis and Papanicolaou screening tests, and prophylactic dental visits.[14-18]

The elements of the traditional Health Belief Model are displayed in Figure 1; they include the individual's perceptions of susceptibility to a disease, the severity of the disease, and the benefits and costs associated with paths of action that can be taken to prevent it. These perceptions are affected by diverse demographic, structural, and sociopsychological variables. A "cue" or triggering mechanism is also held to be necessary for initiating appropriate action.

Rosenstock[18] has reviewed in detail the components of the model and the empirical support for it. Some reviewers[11] have stated that these variables provide a satisfactory explanation for the majority of findings in the area of preventive health behavior, and recent research[19] has confirmed that they can explain some aspects of health action prospectively.

There would seem to be no inherent reason why the same type of formulation should not apply to actions taken by individuals who know that they are ill in order to become well, especially if the concept of susceptibility is extended to mean the probability of progressive effects or of recurrence. For example, Heinzelmann[20] has demonstrated continued prophylaxis behavior (of college students with a history of rheumatic fever) to be related to subjective estimates of the likelihood of having *another* attack, as well as to personal perceptions of the seriousness of the attack.

Study Model

Figure 2 presents the authors' reformulation of the model for use as a predictor of compliance. The perceptions of the child's *mother* are examined since: (1) it is usually the mother (particularly in a low income clinic population) who decides whether or not the child is sick, brought to care, the regimen followed, and so forth; and (2) various studies[21] suggest that many of the health-related attitudes and behaviors that the child will exhibit in later life are

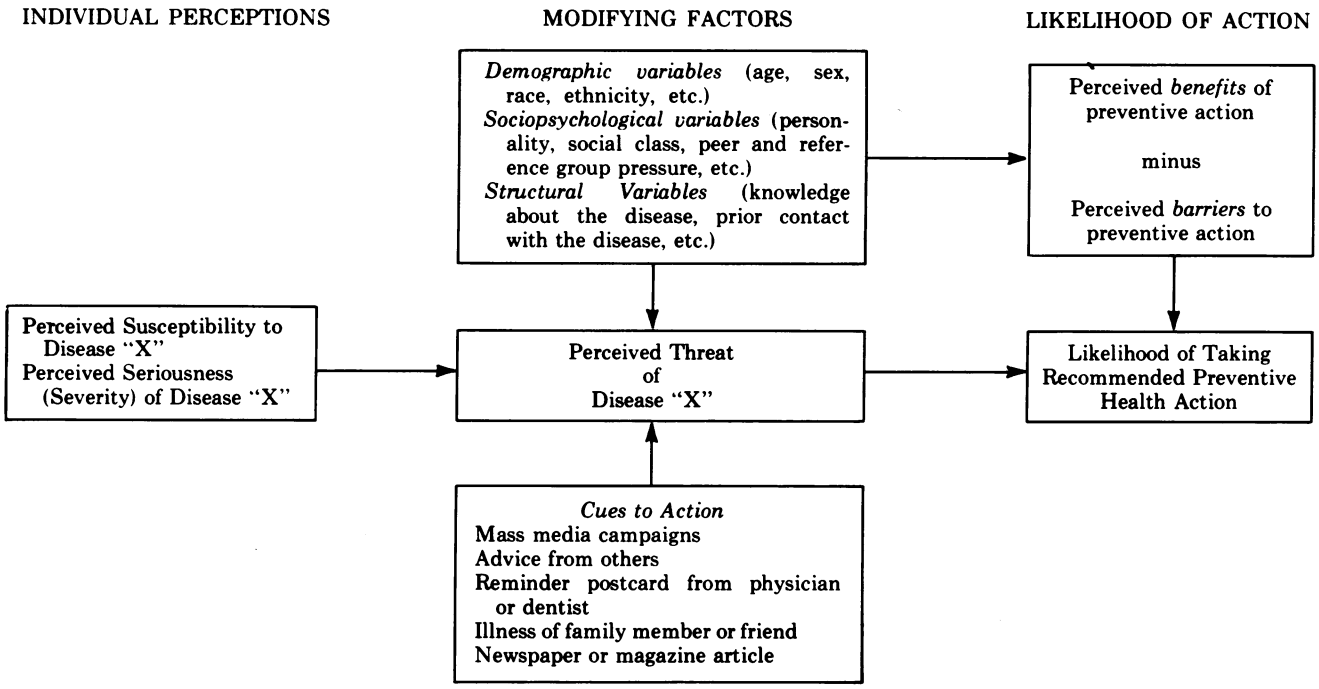
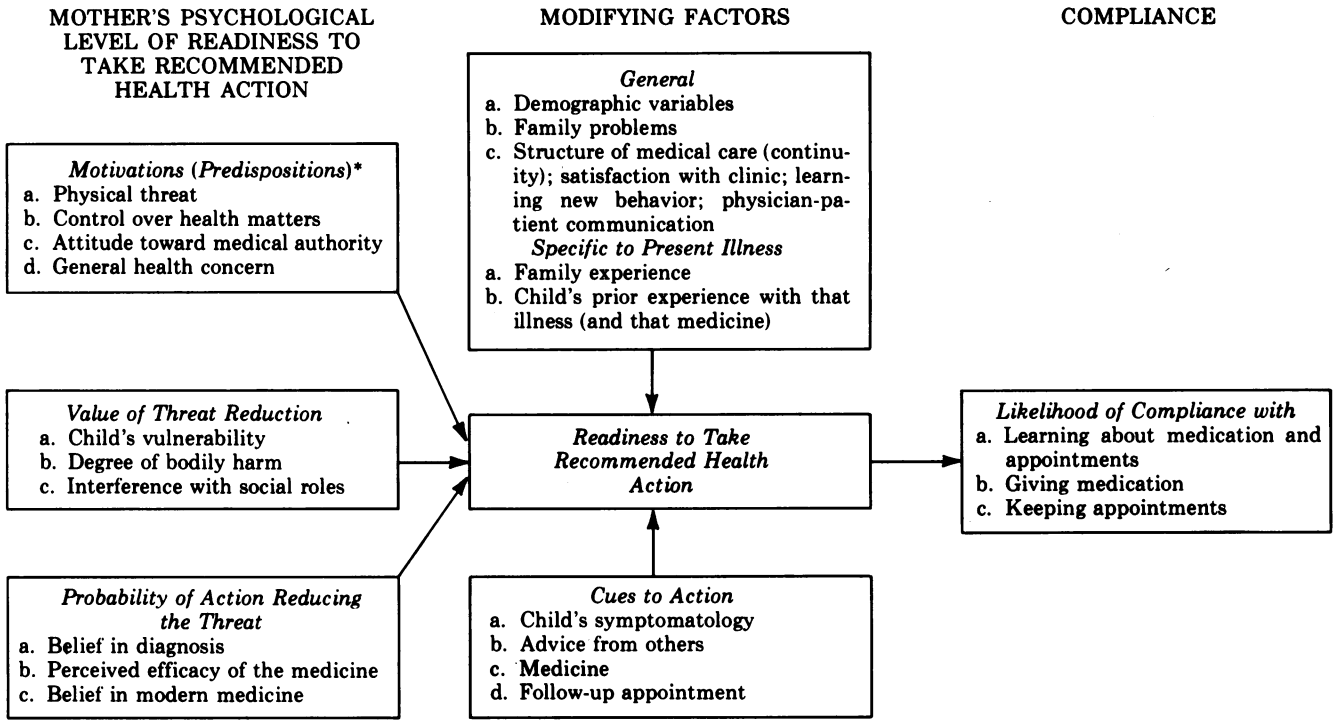


figure 1 The "Health Belief Model" as predictor of preventive health behavior.



* "Motivations" refers to differential emotional arousal in individuals caused by some given class of stimuli (e.g., health matters).

figure 2 Reformulated "Health Belief Model" as predictor of compliance in pediatric situations.

acquired largely from those family members responsible for early definitions of the child's illnesses.

First, the concept of health motivation is introduced explicitly into the model and is measured along four dimensions. The original model dealt only with negative aspects of health, namely, the threat of a disease or condition. Thus, the last dimension (general health concern) suggests that *positive* health motivations exist and account for some portion of health-related behavior.

Second is the "incentive value" of compliance, wherein the magnitude of threat posed by the child's present illness provides an incentive for the mother to attempt some action to reduce that threat. These measures include the mother's perceptions of: (1) the child's vulnerability (since the child is already seen as ill, the concept of potential resusceptibility to the present illness is employed); (2) the degree of bodily harm that the illness may cause; and (3) the problems that the illness may create for the child (e.g., staying in bed, fretfulness) and for herself (e.g., interruption of parental, occupational, or social roles).

Third is the mother's estimate of the likelihood that following the physician's instructions will result in reduction of the threat. This subjective probability is evaluated along three dimensions: (1) perceived accuracy of the diagnosis; (2) perceived usefulness of medications previously obtained from the clinic; and (3) amount of general confidence in the usefulness of modern medical practices.

Because the child is symptomatic and has seen a physician, many cues to action are present. However, readiness to act is still susceptible to the influence of positive and negative modifying factors which may be general in nature or may relate specifically to the present illness. Most salient are the perceived "costs" of the health action, including its availability, difficulty, and interference with other motivational systems.

Finally, the model components combine to explain and predict the probable degree to which the mother will comply with the various cognitive and behavioral aspects of the medical regimen. If indeed, the model variables are useful predictors of behavior, then individuals and groups might be characterized as being principally motivated by different combinations of them, and hopefully, clues would be provided as to the nature of appeals that physicians, health educators, and other health workers might use in attempting to heighten the probability of compliance.

Methods

During early 1971, a random sample of 125 cases was drawn from a population of children being treated for otitis media in the Comprehensive Child Care Clinic at a large teaching hospital. The nature of the study was disclosed neither to the clinic staff nor to the mothers of the patients.

The children ranged in age from 6 weeks to 10 years, and all were placed on a regimen of liquid oral antibiotic and a follow-up visit. The medication was provided free of charge. An hour-long interview was conducted with each respondent immediately after the physician visit. The

respondents ranged in age from 14 to 70 years, and all but three were black. Prior screening assured that only mothers or grandmothers claiming to be the family member responsible for the child's daily care and for bringing the child to the clinic when necessary were included in the sample.

Three interviews were deleted because of extensive incompleteness, and an additional six cases were dropped when it was determined that the child had received an injection of long acting antibiotic during the physician visit. Consequently, 116 usable interviews were ultimately available for analysis.

Dependent Variables

Compliance was operationalized as a *process* involving cognitive elements (learning the name of the medication, the number of times a day it is given, and the date of the follow-up appointment) and subsequent behaviors (administering the medication and keeping the follow-up appointment). Only a few studies[5,22,23] have *simultaneously* examined medication and appointment-keeping as part of compliance with the same regimen.

Extent of accuracy for the cognitive elements was established by comparing the mother's responses with information on the medical record. Instances occurred where the correctness of one or more responses could not be verified, necessitating their removal from relevant analyses. However, chart data on whether or not the follow-up visit was made were more complete; only 40.7 per cent of these appointments were kept.

The most serious measurement difficulties were encountered in obtaining urine specimens for subsequent antibiotic assay. The study design required that Community Health Visitors assigned to the clinic make unannounced visits to the patient's home 5 days after the prescribed start of the medical regimen. Erroneous addresses, persons not at home, problems in obtaining infant samples, inclement weather, the samples not returned or collected more than 24 hr after the deadline were some of the obstacles resulting in the successful collection and testing of only 59 samples. However, none of these hindrances to collection seems a priori to be related to the study variables, and 30 of the samples were negative for the medication prescribed, a noncompliance rate of 50.9 per cent.

Finally, a measure of long run appointment-keeping behavior was calculated for each child by dividing the number of appointments kept by the number of appointments made during a standard 12-month period. Only children with one or more follow-up visits for acute illnesses were included.

Results

It is useful to begin by reporting intercorrelations among the six dependent variables. Table 1 shows substantial relationships among the study measures of knowledge, especially between correctly identifying the medication and knowing the number of times to give it. Furthermore, it is not surprising to find that knowledge of dosage frequency is more highly correlated with giving the medicine than is knowing the name of the drug, or that knowing the follow-up date correlates with keeping the subsequent appointment.

However, six of the 15 correlations in Table 1 are *not* statistically significant. While all of these variables measure related aspects of the compliance phenomenon, they are nonetheless conceptually and empirically different. Some

TABLE 1—Correlations among the Six Dependent Variables Measuring Compliance with Medical Regimens

	Knows Name of Medication		Knows No. of Times Given		Administered Medication		Knows Follow-up Date		Kept Follow-up Appointment		Appointment-Keeping Ratio	
Dependent Variables	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N
Knows name of medication	1.00	98	0.789*	66	0.336*	45	0.463*	91	0.243	86	0.381*	68
Knows no. of times given			1.00	115	0.440*	30	0.372*	64	0.203	60	0.323*	44
Administered medication					1.00	59	0.353*	53	0.269	51	0.160	35
Knows follow-up date							1.00	111	0.310*	95	0.212	77
Kept follow-up appointment									1.00	103	0.295	66
Appointment-keeping ratio											1.00	80

* Designates correlations statistically significant at $p \leq 0.05$.

TABLE 2—Correlations between Various Motivation Variables and Each of Six Measures of Compliance with Medical Regimens

	Dependent Variables											
	Knows Name of Medication		Knows No. of Times Given		Administered Medication		Knows Follow-up Date		Kept Follow-up Appointment		Appointment-Keeping Ratio	
Motivation Variables	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N
a. Physical threat												
Resusceptibility to past illness	0.232	86	0.203	56	0.264	56	0.154	99	0.222	90	0.347*	71
Potential susceptibility to other illnesses	0.405*	90	0.334*	57	0.300	58	0.172	103	0.276	94	0.375*	73
Easily susceptible/ often ill	0.306*	93	0.228	61	0.340*	59	0.263	106	0.199	97	0.314*	76
Illness threat to children in general	0.297	92	0.135	60	0.328*	59	0.126	105	0.172	96	0.303*	74
b. Control over health matters												
Can prevent most illness	0.183	90	0.108	59	0.287	59	0.045	102	0.211	93	0.015	72
Can avoid illness/ accidents	0.274	92	0.163	60	0.021	59	0.192	105	0.282	96	0.288	74
c. Attitude toward medical authority												
"Complier" scale	0.241	92	0.197	60	0.401*	59	0.257	105	0.298*	96	0.190	74
"Do what doctor tells me"	0.330*	92	0.286	60	0.449*	59	0.298	105	0.367*	96	0.315*	74
d. General health concern												
Worry about health	0.431*	92	0.322*	60	0.351*	59	0.506*	105	0.430*	96	0.424*	74
Worry about specific potential illnesses	0.319*	95	0.417*	61	0.292	59	0.157	109	0.169	100	0.342*	77
Takes child to doctor if symptoms appear	0.236	96	0.295	62	0.377*	59	0.101	110	0.275	101	0.385*	78
Lack of delay	0.109	93	0.003	61	0.373*	58	0.054	109	0.339*	98	0.217	77
Gives special foods	0.392*	92	0.355*	60	0.362*	59	0.436*	105	0.400*	96	0.317*	74
Gives vitamins regularly	0.344*	91	0.229	59	0.315*	59	0.355*	104	0.242	95	0.369*	73
Owns fever thermometer	0.414*	93	0.365*	66	0.211	57	0.133	109	0.146	98	0.313*	78

* Designates correlations statistically significant at $p \leq 0.05$.

variables measure single or multiple behavior while others measure knowledge which may or may not be necessary for compliance. Some deal with appointment-keeping, others with medication, and the latter may be especially affected by previous learning experiences. Even the measurement techniques vary, involving both overt responses proximal to the diagnosis and covert analyses of actions occurring at a later date.

The relationships between elements of the model and the six compliance measures are contained in Tables 2 through 7. Table 2 presents these findings for measures of motivation.

Physical Threat

Respondents were read a list of 11 illnesses* and asked: (1) of those the child has had, which ones might he ever get again; and (2) of those the child has not had, which ones might he ever get. The ratio of past illnesses to those which could recur yielded a "resusceptibility" score, while the illnesses not experienced in relation to those which

* The illnesses listed were: bad cold, mumps, polio, asthma, pneumonia, bad cut on arm, rheumatic fever, measles, anemia, strep throat, accidentally drinking something poisonous.

could occur produced a "potential susceptibility" score. Both scores were significantly related to the appointment-keeping ratio, and potential susceptibility was also correlated with knowledge about the medication. Mothers who felt that their children contract illness easily and often, and who perceive illness as an important threat to children in general, were also more likely to keep appointments and, in addition, to give medication.

Control

"Control over health matters" was approached on a general level ("Do you feel that most children's illnesses can be prevented?") and on a specific level ("In an environment such as the one in which I live, you just can't do much to keep a child healthy/from having accidents"). The findings indicate that, at least as measured here, feelings of control are not related to compliance. However, these questions aim at so broad a level of health motivation that the likelihood or predicting a specific health action is low.

Attitude toward Medical Authority

An agree-disagree scale was constructed with statements concerning the mother's willingness to defer to medical advice and intervention (e.g., "Old-fashioned remedies are still better than the things doctors prescribe"). While this "complier" scale predicted giving the medicine and keeping the follow-up appointment, a single question from the scale was more productive. Mothers tending to agree with the statement "I try to do exactly what the doctor tells me to do, without question" were significantly more likely to know the name of the medication, give the medication, make the follow-up visit, and keep appointments in general.

General Health Concern

Study measures of "general health concern" consistently predicted giving the medication and the appointment-keeping ratio—and agreement with the statement "I worry a lot about my child's health" was significantly correlated with all the dependent variables.

A less direct approach to health concern was a score based on a list of 10 symptoms.* The mother was asked, if each symptom appeared, whether she would take her child to a doctor right away or wait a day or two to see what developed. A similar question was asked concerning the mother's behavior when, in general, her child seemed a little sick. Mothers who reported that they tend to take the child to the doctor right away were also more likely to comply with the medication and appointment regimen.

A concern for maintaining good health was evidenced by mothers who stated that they give their children vitamins and/or special foods to try to keep them well, and this concern was substantially associated with all of the compliance elements. Ownership of a fever thermometer, an indicator of medical concern, was positively related to both knowledge about the medication and to the appointment-keeping ratio.

Overall, elements of the model dealing with motivations predicted long run appointment-keeping behavior somewhat better than the other aspects of compliance. Since these measures do not involve any questions about the child's current illness, it seems reasonable that they should be more highly related to multiple health behaviors over a period of time. However, none of the 15 motivational variables did predict compliance with the medication.

Threat Level Variables

Table 3 shows that mothers who felt that their child would probably get an ear infection again were more apt to administer the medication and make the follow-up visit. Other questions about the ear infection obtained the mother's estimates of the seriousness of the present case; intensity, probably duration, and sequelae; and seriousness compared to other illnesses the child has had. This "severity" score proved capable of predicting all of the dependent variables except the appointment-keeping ratio. Mothers also indicated the extent to which the present illness would interfere both with the child's and her own activities, and correlations show the latter measure to be more useful because of its ability to predict knowledge, giving the medicine, and the appointment-keeping ratio.

Only one "threat" variable was significantly associated with long run appointment behavior, while almost all previous "motivation" measures were good predictors of such behavior. It appears that measures of perception related to a specific illness are probably (and logically) the best predictors of behavior relevant to that illness, while perceptions of health matters at a higher level of abstraction are likely to be most consistently correlated with health behaviors independent of that illness.

Threat Reduction Variables

The "degree of certainty" score (Table 4) was based on three views of the present diagnosis: extent of agreement between the mother and physician concerning what was wrong with the child; the mother's opinion of how certain the doctor felt about his diagnosis; and how sure a doctor could be of diagnosing an ear infection by looking into a child's ear. Mothers with more confidence in the diagnosis were more knowledgeable about the medication and the follow-up date, and more of them complied with the medication regimen. However, the fact that this score is also related to the appointment-keeping ratio suggests that, while the questions asked about a specific episode, the responses reflected a more general faith in physicians and in their ability to diagnose illnesses.

The second measure of threat reduction, the mother's

* The symptoms listed were: some fever, a sudden drop in eating, some pain in the right side of belly, nightmares, throwing up a few times during the day, doing poorly in school, diarrhea, cough for a couple of days, urine different from usual, sore throat and runny nose.

TABLE 3—Correlations between Various Estimates of Threat Levels Due to Present Illness and Each of Six Measures of Compliance with Medical Regimens

	Dependent Variables											
	Knows Name of Medication		Knows No. of Times Given		Administered Medication		Knows Follow-up Date		Kept Follow-up Appointment		Appointment-Keeping Ratio	
Threat Level Variables	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N
a. Vulnerability												
Potential resusceptibility to present illness	0.223	97	0.116	62	0.367*	59	0.254	110	0.339*	102	0.122	80
b. Degree of bodily harm												
Severity of present illness (score)	0.390*	98	0.333*	63	0.416*	59	0.384*	111	0.340*	103	0.288	80
c. Interference with social roles												
For child	0.328*	94	0.325*	60	0.225	58	0.101	106	0.012	97	0.275	75
For mother	0.350*	94	0.388*	61	0.307*	59	0.065	107	0.176	98	0.325*	76

* Designates correlations statistically significant at $p \leq 0.05$.

TABLE 4—Correlations between Variables Affecting Perceived Probability of Threat Reduction through Health Action and Each of Six Measures of Compliance with Medical Regimens

	Dependent Variables											
	Knows Name of Medication		Knows No. of Times Given		Administered Medication		Knows Follow-up Date		Kept Follow-up Appointment		Appointment-Keeping Ratio	
Variables (Independent) Affecting Threat Reduction	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N
a. Belief in diagnosis												
Degree of certainty score	0.563*	98	0.337*	63	0.463*	59	0.339*	111	0.287	103	0.345*	80
b. Efficacy of the medicine												
Belief in efficacy of clinic medicine	0.560*	95	0.289	60	0.332*	57	0.034	106	0.081	98	0.157	80
c. Efficacy of modern medicine												
Doctors' ability to cure illnesses on list (score)	0.118	95	0.147	61	0.286	59	0.250	109	0.120	100	0.382*	77

* Designates correlations statistically significant at $p \leq 0.05$.

evaluation of the usefulness of medicines obtained previously from the clinic, yielded significant correlations only with giving the medicine and knowing its name. Lastly, mothers were requested to evaluate the degree to which doctors would help or cure each illness on the list described earlier. This score, unrelated to the present illness, proved to be significantly correlated only with the appointment-keeping ratio, reinforcing the notion of relationships among general health belief measures and long run health behaviors.

Demographic Variables

It is clear from Table 5 that age and marital status of the mother are generally independent of compliance behavior. Moreover, the mother's level of formal education is significantly related only to the cognitive or "learnable" aspects of compliance (a reminder that information is a necessary resource, but not always a sufficient motivation, for health action). The presence of more persons in the home predicted only long run appointment-keeping, per-

TABLE 5—Correlations between Various Demographic Variables and Family Problems Modifying Readiness to Take Health Action and Each of the Six Measures of Compliance with Medical Regimens

Modifying (Independent) Variables (General)	Dependent Variables											
	Knows name of medication		Knows no. of times given		Administered medication		Knows follow-up date		Kept follow-up appointment		Appointment-keeping ratio	
	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N
a. Demographic variables												
Age of mother	0.116	92	0.247	60	0.126	59	0.154	105	0.132	96	0.121	74
Marital status	0.163	91	0.057	59	0.189	58	0.333*	104	0.156	95	0.235	73
Education of mother	0.302*	92	0.407*	60	0.235	59	0.394*	105	0.159	96	0.168	74
Number of persons in home	0.215	92	0.121	60	0.176	59	0.169	105	0.230	96	0.317*	74
Mother's health	0.207	92	0.098	60	0.212	59	0.093	105	0.134	96	0.360*	74
Social class expectation												
Desire for child	0.354*	92	0.282	60	0.500*	59	0.176	105	0.258	96	0.348*	74
Expectancy score	0.455*	87	0.530*	56	0.281	55	0.328*	100	0.358*	92	0.341*	70
Worry about being a "good" mother	0.517*	92	0.330*	60	0.364*	59	0.174	105	0.254	96	0.276	74
b. Family problems												
Little family sickness	0.246	92	0.234	60	0.058	59	0.165	105	0.125	96	0.059	74
Few family problems	0.185	91	0.094	59	0.224	59	0.134	104	0.118	95	0.190	73
Easy to get through day	0.300	92	0.234	60	0.556*	59	0.482*	105	0.319*	96	0.418*	74
Easy to care for children	0.198	92	0.017	60	0.305*	59	0.280	105	0.274	96	0.310*	74

* Designates correlations statistically significant at $p \leq 0.05$.

haps reflecting the convenience of having someone available to stay with other children while the mother takes the child to the clinic. A similar interpretation may be placed upon the corresponding relationship between overall appointment-keeping and the mother's reporting that she is in relatively good health.

The study population was, of course, relatively homogeneous with regard to social class. Some investigators, however, have examined the behavior of mothers by studying their desires for their children's future status.[24,25] In the present research, status aspiration and expectancy were determined by asking the mother how far she would *like* her child to progress in his formal education, and what she expected would *actually* happen to her child's schooling. Comparing expectation to reported hope yielded an "expectancy" score wherein the estimate of reality could be above, equal to, or below aspiration. The findings in Table 5 suggest that when hope and expectancy are combined, mothers who both hope for and expect more status for their children were relatively better compliers on all dimensions. Also, the more the respondent was worried about being a "good" mother, the more likely she was to know the medication and to continue its use.

Family Problems

Because low income families are frequently categorized as "disrupted" or "disorganized," these problems might act as substantial barriers to compliance. Data in Table 5 show general estimates of frequency of illness and extent of problems in the family to be unrelated to compliance. However, mothers who reported that it is difficult for them to get through the day and to take care of their children were much more likely to be poorer compliers in terms of giving the medicine and long run appointment-keeping behavior; further, daily problems also seem to interfere with keeping the follow-up appointment for this illness episode.

Structure of Care

"Continuity of care" has been a public health and medical care shibboleth for some time, but the putative benefits of such an arrangement for delivering health services have rarely been examined empirically.[26,27] Several findings in Table 6 suggest that having the child see the same physician on subsequent visits to the clinic does have an ameliorative effect on compliance.

Seeing the same physician is associated with an increased probability that the follow-up visit for the present illness would be kept. Furthermore, previous treatment of this child by the same physician increased the likelihood of the medicine's being given and of the mother's knowing how many times a day to give the medicine. However, the

extent to which the mother reported usually seeing the same physician correlated significantly with *all* the compliance variables, making it the only continuity measure that predicted long run appointment-keeping.

The remaining correlations in Table 6 demonstrate that a higher level of satisfaction with the clinic increased the probability of the mother's giving the medicine and keeping both immediate and future follow-up appointments.

Relative to physician-patient interaction, each respondent was asked whether she agreed or disagreed with the following statements: "Sometimes the doctors here don't tell me exactly what to do" and "The doctors here want me to bring my child back for more visits even if it really isn't necessary." Disagreement with both statements was positively related to giving the medication and to knowing the correct date of the follow-up visit. Finally, the feeling that the clinic doctors only scheduled necessary return visits was significantly associated with keeping specific and general follow-up appointments.

The remaining modifying factors examined in the current research relate to the specific illness episode studied; the relevant correlations are presented in Table 7.

Family's and Child's Experience

Prior experience with ear infections incurred either by other family members or by the child increased the likelihood that the medicine would be given and the

TABLE 6—Correlations between Modifying Variables Related to Structure of Medical Care and Each of Six Measures of Compliance with Medical Regimens

Modifying (Independent) Variables	Dependent Variables: Knows name of medication		Knows no. of times given		Administered medication		Knows follow-up date		Kept follow-up appointment		Appointment-keeping ratio	
	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N
c. Structure of medical care												
Physician treated this child before	0.207	95	0.310*	61	0.360*	58	0.286	108	0.300*	100	0.203	78
Physician treated other children before	0.003	62	0.176	34	0.287	39	0.491*	71	0.550*	64	0.271	50
Generally sees same physician at clinic	0.314*	89	0.329*	57	0.596*	55	0.327*	99	0.316*	90	0.376*	74
Satisfaction with clinic (score)	0.259	92	0.270	60	0.302*	59	0.317*	105	0.348*	96	0.471*	74
Physicians' instructions	0.344*	90	0.132	58	0.478*	58	0.422*	103	0.290	94	0.252	74
Necessity of follow-up visits	0.275	90	0.185	58	0.377*	56	0.310*	102	0.364*	93	0.317*	74

* Designates correlations statistically significant at $p \leq 0.05$.

TABLE 7—Correlations between Modifying Variables Related to This Illness, and Each of Six Measures of Compliance with Medical Regimens

Modifying (Independent) Variables (Specific to This Illness)	Dependent Variables: Knows name of medication		Knows no. of times given		Administered medication		Knows follow-up date		Kept follow-up appointment		Appointment-keeping ratio	
	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N	Gamma	N
a. Family experience												
Others get ear infections	0.459*	96	0.398*	61	0.563*	58	0.308*	109	0.322*	101	0.290	79
b. Child's experience												
Had it before	0.519*	97	0.457*	61	0.345*	57	0.279	109	0.270	101	0.169	79
No. of times before	0.736*	70	0.536*	43	0.360*	42	0.291	74	0.325*	70	0.131	56

* Designates correlations statistically significant at $p \leq 0.05$.

follow-up appointment kept. The notion that health knowledge is influenced by the availability of repeated learning experiences is supported by the substantial gammas relating prior ear infections and knowledge about the specific drug. On the other hand, probably because they relate only to the specific illness under study, none of these measures was capable of predicting general appointment-keeping behavior.

Discussion

Test of the Model

The model appears to be useful in the explanation and prediction of compliance behavior. Whether at a general level or at a level dealing with the specific illness studied, variables are found in each major category of the model which are related to compliance. Unfortunately, the data require nonparametric analysis, and multivariate techniques for simultaneously evaluating the entire model have not yet been worked out.[28]

However, while the elements are clearly not independent, neither are they strongly related. The authors examined the relationships among the independent variables and found that one or two basic, general factors could *not* account for the patterns of associations. Further, some simple characteristic such as "level of mother's education" does not explain the results.

Limited partial analyses were performed, using "high-low" splits on a succession of control (mainly demographic) variables. None of the major model correlations was significantly attenuated by this procedure. Further, despite the normative prohibitions against employing parametric methods on nonparametric data, attempts were made to perform multiple correlations along several model dimensions. Overall, these findings tend to support the model's combinations of variables, and also, to suggest some additional general themes which are discussed below.

Sick-Role Behavior

Since public health professionals are probably most concerned with the behavioral dimensions of adherence to regimens, a summary is provided in Table 8 of variables in each category of the model which were found to be related

TABLE 8—Summary of Health Belief Model Variables Found to Be Significantly Related to the Three Study Measures of Compliance Behavior*

- Motivations
  - a. Physical threat
    - Resusceptibility to past illness (R)
    - Potential susceptibility to other illnesses (R)
    - Easily susceptible/often ill (M/R)
    - Illness threat to children in general (M/R)
  - b. Control over health matters
    - None
  - c. Attitude toward medical authority
    - "Complier" scale (M/A)
    - "Do what doctor tells me" (M/A/R)
  - d. General health concerns
    - Worry about health (M/A/R)
    - Worry about specific potential illnesses (R)
    - "Take-wait" list (M/R)
    - General delay (M/A)
    - Special foods (M/A/R)
    - Vitamins (M/R)
    - Owns thermometer (R)
- Value of Threat Reduction
  - a. Vulnerability
    - Potential resusceptibility to present illness (M/A)
  - b. Degree of bodily harm
    - Severity of present illness (M/A)
  - c. Interference with social roles
    - For mother (M/R)
- Probability of Action Reducing the Threat
  - a. Belief in diagnosis
    - Degree of certainty (M/R)
  - b. Efficacy of the medication
    - Belief in efficacy of clinic medications (M)
  - c. Efficacy of modern medicine
    - Doctors' ability to cure illnesses on list (R)
- Modifying Factors—General
  - a. Demographic variables
    - Number of persons in home (R)
    - Mother's health (R)
    - Social class expectation—desire for child (M/R)
    - Social class expectation—expectancy (A/R)
    - Worry about being "good" mother (M)
  - b. Family problems
    - Get through day (M/A/R)
    - Care for children (M/R)
  - c. Structure of medical care
    - Physician treated this child before (M/A)
    - Physician treated other children before (A)
    - Generally sees same physician at clinic (M/A/R)
    - Satisfaction with clinic (M/A/R)
    - Physicians' instructions (M)
    - Necessity of follow-up visits (M/A/R)
- Modifying Factors—Specific to This Illness
  - a. Family experience
    - Others get ear infections (M/A)
  - b. Child's experience
    - Had it before (M)
    - Number of times had it before (M/A)

* Each variable is evaluated as a predictor of "administered medication" (M), "kept follow-up appointment" (A), and "appointment-keeping ratio" (R).

significantly to giving the medication, to keeping the follow-up appointment, and to the appointment-keeping ratio.

A general theme emerges characterizing the mother who is relatively less likely to adhere to the medical regimen. This mother is little aroused by stimuli involving health matters; she sees her child as relatively healthy and likely to remain so (this may well be the child's first ear infection). As a consequence, she does not feel much need to attend to medical advice, to take the child to a doctor as soon as symptoms of illness appear, or to undertake special activities to maintain her child's health; indeed, she is likely not even to own a thermometer to take her child's temperature. The child's present ear infection is not seen as presenting much threat, either physiologically or socially. The noncomplier is somewhat skeptical of the particular diagnosis, and of the medical care her child usually receives. Little confidence is displayed in either medicine in general, or in the treating physician.

A second broad factor relates to the mother's *self*-perceptions. The noncomplier evaluates her own health as relatively poor. It is difficult for her to get through the day and to care for her children, and there are fewer persons living in the home to help her. She is thus able to report many reasons for not being able to administer the medication properly or to keep follow-up appointments. In general, she is rather dissatisfied with most aspects of the clinic, where she usually sees a different physician at each pediatric visit (these factors may be partially responsible for her relative lack of faith in the particular medical care system).

Learning

Another general theme, of special interest to health educators, reflects the effect of prior medical care experiences on the learning of health information. The mother found to be more knowledgeable about the medication has a child who is often ill, and she has learned the value of owning a fever thermometer. She tends to see the same clinic physician on each visit, increasing the likelihood of having received the same medication and instructions before; and she has had the opportunity to learn about the treatment of ear infections because her child and/or other family members have previously had such infections. She has also learned, through positive experiences at the clinic, the value of keeping follow-up appointments.

These "themes" or attitudinal clusters which emerge from the data are perhaps more deserving of attention (as well as future research) than are the individual items in the model, as they represent predispositions which are likely to be maintained over time even when changing circumstances and influences modify specific variables. The existence of these general factors would argue for stressing broader educational (and other) approaches to changing underlying perceptions and attitudes in addition to more specific instructions and exhortations.

Summary

Sick-role behavior, such as administering medication and keeping follow-up appointments, is often very inadequate in low income groups. The present research tested the explanatory value of a model which uses a mother's health perceptions and attitudes as predictors of the extent to which she complies with a pediatric medical regimen. The mothers of a random sample of 125 children being treated for otitis media with an antibiotic were interviewed in a clinic setting.

Mothers who complied with various aspects of the prescribed regimen are relatively more interested in their child's health in general, and are more concerned about the present illness episode. They perceive that illness is a substantial threat to their child, but have confidence in the ability of physicians and medication to reduce this threat. These mothers worry about the child's health and engage in behavior they feel will prevent future illness. Finally, they appear to have had more satisfactory interactions with the clinic, and seem better able to manage life problems.

Hopefully, variables studied and themes evolved will enable health professionals to gain a better understanding of the problems that different mothers might have in carrying out medical instructions. On the basis of the study findings, it should be possible to construct a relatively brief index of questions to be administered to each mother, the answers to which might aid the health worker in estimating the likelihood of each mother's complying with the prescribed regimen, and in identifying the problem dimension or dimensions in each case. The perceptions and attitudes which make up the model are potentially alterable[19]; thus, by knowing which model components are below a level presumed necessary for compliance, the health worker* may be able to tailor intervention to suit the particular needs of each individual.

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* Similar activities have been suggested for inclusion as part of the "new role" of the pharmacist.[29]

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