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**ABSTRACT**

In order to assess children's perceived vulnerability to health problems, a longitudinal study was designed to observe third and seventh graders at five intervals over a 2-year period. The hypotheses tested concerned relationships between perceived vulnerability to health problems and age, sex, and socioeconomic status. Data were obtained from a group administered a 15-item questionnaire; a characteristic item illustrating the basic format of these questions was "What chance is there of your getting the flu during this next year?" The specific health problems investigated were a bad accident, a rash, a fever, having a tooth pulled, a sore throat, a toothache, a cold, bleeding gums, an upset stomach, being sick enough to miss a week of school, a cavity, a bad headache, breaking or cracking a tooth, and cutting a finger. Seven additional questions were used as filler items. For each question the subjects selected one response from seven alternatives in a quasi-interval scale. Results indicated that age was significantly but nonlinearly related to perceived vulnerability. Females showed significantly higher levels of perceived vulnerability than did males. In the younger sample, perceived vulnerability was related positively to higher socioeconomic status. Implications for theory and health education programs are discussed. (Author/DB)

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## DEVELOPMENT AND DEMOGRAPHY OF PERCEIVED VULNERABILITY IN YOUNGSTERS

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### Introduction

Perceived vulnerability, conceptually defined as the degree to which persons believe they are susceptible to, or might encounter, a variety of health problems, illnesses or accidents, has been a major focus of an integrated series of studies since 1967 (e.g., Gochman, 1969; 1970; 1971a,b,c; 1972a,b; 1977a,b; Gochman, Bagramian and Sheiham, 1972; Gochman and Sheiham, 1978).

According to the health-belief model, perceived vulnerability, in some instances referred to as perceived susceptibility, is a critical determinant of health behavior (e.g., Rosenstock, 1974). In this essentially cognitive, rational model, perceived vulnerability has appeared to have greater value than other variables (e.g., Hochbaum, 1958; Kegeles, 1963; Kirscht et al., 1966; Rosenstock, 1974, p. 376) in predicting a variety of health behaviors. Rarely, however, had this important variable been studied in a large-scale, rigorous way in young populations. Of particular interest to both developmental psychologists and to a broad range of health professionals, is whether perceived vulnerability shows developmental changes and whether it is related to sex and socioeconomic status.

Evidence exists that among children and young adults perceived vulnerability can be interpreted as a consistent personality characteristic (Gochman, 1970, 1971c): respondents who see themselves as highly likely to encounter one illness or health problem also see themselves as similarly likely to encounter others.

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Accumulated literature on children's fears of remote dangers (e.g., Hurlock, 1959, pp. 179-180), suggests that such fears become heightened as children grow older. To the degree that perceived vulnerability to health problems is such a fear, it would be expected to increase with age, and a developmental hypothesis emerges: perceived vulnerability to health problems is directly related to age. No specific predictions were made relating perceived vulnerability to socioeconomic status, or to sex.

### Method

#### Sample selection

Complementing earlier cross-sectional research (e.g., Gochman, 1972a), a longitudinal study was designed to observe school children at five semi-annual intervals over a two-year period, beginning in November, 1970.

An initial sample of 1341 youngsters was identified in the Flint, Michigan School System: 686 in third-grade classes (two in each of twelve elementary schools) and 655 in seventh-grade classes (six in each of four junior high schools), selected from a population of schools with the following characteristics: 1) a principal who maintained a favorable attitude toward the research, 2) students who were thought to be willing to cooperate, and 3) location in a neighborhood with an expected low rate of family mobility. When these factors were considered in conjunction with the necessity of seeking socioeconomic heterogeneity, there was virtually no freedom to permit probability sampling.

Of the 1341 respondents who participated in the first questionnaire administration, 605 completed all five sessions. Two factors account for this unexpected attrition: 1) a school that had initially agreed to participate,

subsequently withdrew from the study after the first two sessions for reasons related to the research, and 2) several new schools were constructed in neighborhoods adjacent to those in the study, leading to the transfer of numerous respondents between the third and fourth questionnaire sessions. This only came to light after the fact. On the basis of rather acceptable attrition levels between the second and third sessions (when in fact a considerably higher level had been anticipated) only minimal attrition was expected at these later sessions. Although no resources were available for systematic follow-ups, a rigorous attempt was made between the fourth and fifth session to reach all respondents who had completed the first four sessions, as well as those who had completed at least the first and third.

#### Socioeconomic status

Using income and educational level data, obtained at the time the study was initiated for each of the city's residential areas by the Flint City Health Department and the Michigan Department of Public Health, Center for Health Statistics; and superimposing maps of the school districts on maps of these residential areas, it became possible to rank each school district in terms of the following indices: percent of families reporting an income of less than \$4,000 per year, percent of families reporting an income of at least \$12,000 per year, percent of persons reporting completion of less than 12 grades of school, and percent of persons reporting completion of at least four years of college. (The school districts were ranked independently by both the investigator and an assistant in research; rho's ranged from .80 to .92 for the four dimensions for the twelve elementary schools.). The

sum of their two sets of rankings provided a single measure for each school in each of the four dimensions. These were then totalled across each of the four dimensions to provide a final sum for each school. The distribution of these sums led to grouping the twelve elementary schools into three socioeconomic levels: low (2), middle (6), and high (4); and the four junior high schools into low (1), low-middle (2) and high-middle (1) levels. Sample characteristics are provided in Table 1.

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Table 1 about here

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### Perceived vulnerability

Perceived vulnerability to health problems was measured through responses to a series of fifteen expectancy-type questions. The general form of these was: "What chance is there of your getting the flu during this next year?" The specific health problems were: a bad accident - like breaking an arm, a rash, a fever, having a tooth pulled, a sore throat, a toothache, a cold, bleeding gums, an upset stomach, being sick enough to miss a week of school, a cavity, a bad headache, breaking or cracking a tooth, cutting a finger accidentally. An additional set of seven questions dealing with social, family and athletic activities, were included as filler items.

For each question the subjects selected the one response from seven alternatives that best expressed their own expectancy. These alternatives were: no chance, almost no chance, a small chance, a medium chance, a good chance, almost certain, and certain.

Pilot work demonstrated the suitability of this format for the target population.

Instructions. Special instructions were provided to insure that the nature of the questions and response alternatives were clearly understood. For example, among the very youngest children, those eight or nine years old, the person administering the questionnaire would point to the "no chance" response and ask how many of them could read it. A respondent volunteer was then sought to read it aloud. Then another volunteer gave an explanation of the phrase. When a satisfactory explanation was provided, the same procedure was followed with the other response alternatives. The essential core of these instructions conveyed an understanding of the differences among the seven responses and of the continuum underlying them.

In addition, the phrase "during this next year" was clarified as meaning "between today and year from today."

Scoring. The responses were scored as follows: "1" for the "no chance" alternative, "2" for "almost no chance" and so forth through the continuum to "7" for "certain." These scores were treated as a quasi-interval scale (Cureton, 1968).

Reliability. Prior research (e.g., Gochman, Bagramian and Sheiham, 1972) revealed the measure to be reliable in terms of internal consistency. In addition in the current study, odd-even  $r$ 's of .66 and .68 ( $p < .0001$ ), were observed in the third and seventh grades, respectively. A subsample revealed the measure to be reliable in terms of stability as well, with a test-retest  $r$  of .82.

Procedure. Questionnaires measuring perceived vulnerability, among other variables, were group-administered during regularly scheduled class

time. To de-emphasize the "achievement test" atmosphere that attends any such administration within a classroom, each page of the questionnaire was prepared on different colored paper. The potential respondents were assured of confidentiality and anonymity that there were no right or wrong answers and that the questionnaire was not a test. They were permitted to decline to participate if they wished. In all classes, to insure standardization, each item was read aloud.

### Results

Table 2 outlines the mean perceived vulnerability scores for each sample at each of the five sessions, and for each sex and socioeconomic level at the first session.

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Table 2 about here  
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To test the hypothesis that perceived vulnerability is directly related to age, and to examine how perceived vulnerability is related to sex and to socioeconomic status, a multiple analysis of variance was selected based on repeated measures at different times for complete cases (e.g., Cole and Grizzle, 1966; Grizzle and Allen, 1969). One-way analyses of variance or t-tests required because of interactions are based on a larger array of cases. The model's assessment of the main effects of sex and socioeconomic status is based on an average of scores across all five points in time.

### Developmental effects

Among third graders a significant main effect was observed for age, i.e., change over time, in the entire sample ( $F=25.43$ ,  $df=4/318$ ,  $p.<.0001$ ). However, a significant three-way interaction between sex, socioeconomic status and change over time ( $F=2.31$ ,  $df=8/636$ ,  $p.<.02$ ) necessitated analyses of each sex/socioeconomic group. Significant change over time was observed in each of these six groups: each group showed significant positive slope; each female group showed significant curvilinearity as well. Table 3 outlines these analyses.

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Table 3 about here  
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Among seventh-graders a significant main effect was observed for age in the entire sample ( $F=2.79$ ,  $df=4/269$ ,  $p.<.05$ ), with no significant two-way or three-way interactions. This change over time, however, showed significant negative slope ( $F=5.55$ ,  $df=1/272$ ,  $p.<.02$ ), and no curvilinearity. In addition, seventh-graders had significantly higher levels of perceived vulnerability than third-graders (4.34 vs. 3.49,  $t=15.64$ ,  $p.<.001$ ).

Age is then significantly, but nonlinearly, related to perceived vulnerability. Perceived vulnerability increases developmentally within the third-grade sample, but the precise shape of the developmental curve varies with sex. Within the seventh-grade sample perceived vulnerability decreases developmentally, and at the final session approached the level observed at the final session among third graders. While the



hypothesis is only partially confirmed, older respondents do demonstrate higher levels of perceived vulnerability than younger ones.

### Sex

In the third-grade, while a significant main effect was observed for sex ( $F=4.42$ ,  $df=1/321$ ,  $p < .05$ ) the significant three-way interaction necessitated further analyses. T-tests showed that females have significantly higher levels of perceived vulnerability than males at sessions two, three and five, but within the three different socioeconomic levels this sex difference was not consistently significant. Among seventh-graders a significant main effect was also observed for sex ( $F=7.65$ ,  $df=1/272$ ,  $p < .01$ ), with no interactions. Females showed significantly higher levels of perceived vulnerability than males (at every session except the first one).

### Socioeconomic status

While a significant main effect for socioeconomic status was observed among third-graders ( $F=4.44$ ,  $df=2/321$ ,  $p < .02$ ), the significant three-way interaction necessitated further analyses. One-way analyses of variance revealed that at each of the five sessions socioeconomic status was significantly and directly related to perceived vulnerability. Among males, however, no significant relationship was observed at the first two sessions, but significant, direct relationships were observed at all three subsequent sessions. Among females a direct significant relationship was observed at the first two sessions and at the fifth session; a significant non-linear relationship was observed at the fourth session (3.93, 3.79, 4.28).

Among seventh-graders no main effect was observed: socioeconomic status and perceived vulnerability were unrelated.

### Discussion

There is partial support for the hypothesis that perceived vulnerability to health problems is directly related to age.

When previously reported cross-sectional data (e.g. Gochman, 1972) are added to these observations, perceived vulnerability can be seen to increase up to about age 14 and then decrease, although the nature of these developmental changes is affected both by sex and socioeconomic status. As Muller (1978) has suggested, the observed curvilinearity may be a mirror of the curvilinearity of the stress, tension and anxieties that accompany the pubescent and post-pubescent developmental stages. Moreover, the significant developmental effects are not appreciable ones. The mean values of perceived vulnerability hover rather closely around "4," the midpoint of the scale -- a point of neutrality -- indicating that the respondents view themselves as neither especially vulnerable or invulnerable. While this scale value was labeled "a medium chance," a response alternative that was readily grasped as being a midpoint by all elements of these heterogeneous samples, in two earlier studies where the response alternative was labeled "as likely as not" and the question format differed slightly, the results were similar: in one earlier sample the mean perceived vulnerability score was 4.098, and in another it was 4.057. Regardless of the phrasing of the question or of the response alternatives, children and young adults do not perceive themselves as generally vulnerable to health problems. In natural environments where no specific attempts are made to alter them, these beliefs do not change appreciably by themselves. Developmental change in the direction assumed most desirable by health

professionals is more likely to occur prior to age 14; but the degree to which such change occurs -- in the absence of change inducing agents -- is minimal. By the time the youngsters had reached the study samples, they had already acquired relatively stable beliefs about being vulnerable to health problems.

In contrast to the equivocal nature of the developmental effects, sex differences are clearly consistent. Females nearly always show significantly higher levels of perceived vulnerability than males. In contemporary American society, differential socialization of the sexes begins virtually at birth. The process differentially reinforces dependency, and females are more likely than males to be made aware of a variety of potentially distressing environmental and experiential encounters. Such reinforcement patterns, together with the greater ease with which females admit to anxieties and concerns about bodily dangers (e.g., Mussen, Conger, and Kagan, 1963, p. 463); are consistent with the observed differences in perceived vulnerability. Accumulated research reveals that sex differences in interests, values, emotionality and temperament arise in American youth at an early age (Stone and Church, 1957, pp. 224-241). Young girls show greater fearfulness; social sensitivity, cooperation, and conformity than young boys (Stone and Church, p. 230), greater interest in the unfortunate and in social welfare, and less willingness to take risks (Tyler, 1968, pp. 209-210). The sex differences observed in this study are thus not surprising, but are congruent with differential socialization of the sexes.

Data on childrens' health (United States Department of Health, Education, and Welfare, 1970-1971) offer no consistent evidence that

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females are in fact more often sick than males; if anything, males seem to suffer more from a variety of health problems. Thus, there is no support for an experiential determinant of sex differences in perceived vulnerability.

The absence of consistent and enduring socioeconomic effects upon perceived vulnerability is of great interest. Although socioeconomic status is directly related to perceived vulnerability among younger respondents, its effect disappears among older ones.

One explanation of this is derived from Green's model of status identity (1970) which asserts that persons in low socioeconomic groups who increase their contact and communication with members of middle and higher socioeconomic groups are more likely to be influenced by the norms of these latter groups.

As Koos' work (1954) indicates, social and cultural factors enter into appraisals of what sensory input or feelings will be labelled as illnesses. Possible this occurs to a greater degree in younger than in older children and young adults. Social and cultural factors may thus be more important determinants of threshold levels for interpreting experiences of illness in younger populations.

### Implications

Research. At the very outset, the research continues to confirm that selected health-related cognitions can be reliably measured in young populations, and that with some ingenuity, conceptually-rooted questionnaires can be developed and successfully administered to respondents as young as eight. As a result of such instrument development it became possible to

obtain and analyze data in an area where none had previously existed. Furthermore, the literature on human development revealed that virtually no longitudinal studies had been conducted using measures based on more than two points in time. In this sense, the study is a pioneer venture.

These studies, through both their focus and method, clearly help to fill a tremendous knowledge gap, a problem already attested to strongly by others (e.g., APA Task Force, 1976; Evans and Dembroski, 1975). The findings thus increase understanding of children's health cognitions, an area that with few exceptions (e.g., Campbell, 1978; Gochman, 1977; Natapoff, 1978; Saucier, 1979) has been seldom investigated rigorously.

Future research is needed to discover the determinants of perceived vulnerability. For example, to what degree do its roots lie in other personal characteristics such as anxiety or self-concept or in personal and family health experiences? And research is needed in much younger populations.

School programs. Although health-related beliefs do exhibit some significant developmental changes both in content and structure, few of these changes are of an appreciable magnitude. Health beliefs show a natural "conservatism." To the degree that they reflect part of a person's central, "primitive" beliefs, (e.g., Rokeach, 1960), they are highly unlikely to change as readily in later childhood or adulthood as they might at much earlier ages.

Therefore, health education programs should be planned, developed and implemented for pre-school children as young as two or three.

The stability together with the observed internal consistency (Gochman, 1970, 1971c) suggests that perceived vulnerability demonstrates "systemic" qualities (e.g., Gochman, 1973) and that its individual components will not change on a piecemeal basis. A person's sense of being vulnerable to some one health problem is anchored by the person's sense of vulnerability to other problems. Accordingly, health education and health promotion programs should be comprehensive and multi-targeted.

Rather than focus solely upon cognitions related to a single disorder or problem, health promotion campaigns and programs might more successfully try to change simultaneously beliefs about being vulnerable to a larger number of problems. A program aimed at influencing levels of perceived vulnerability to coronary disease, for example, might be more successful if it focused also on respiratory disease, cancer and accident proneness.

In parallel fashion, the systemic quality of health cognitions suggests a re-evaluation of health education programs. Discrete educational units such as dental health education, sex education, homemaking, and nutrition, physical education, drivers training, etc., characterize contemporary approaches to health education. The evidence that health cognitions are related to one another suggests that health education be approached comprehensively - that dental health education, for example, be embedded and integrated into larger health education contexts, rather than divorced from these larger frameworks.

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TABLE J. SAMPLE CHARACTERISTICS

3rd Graders					7th Graders			
Age, first session	104 months, s.d., 6 months; 8 2/3 years				152 months, s.d., 6 months; 12 2/3 years			
Sex	Males	Females	(M.D.)	N	Males	Females	(M.D.)	N
First session	376, 55.1%	306, 44.9%	(4)	686	326, 50.1%	325, 49.9%	(4)	655
Complete data	183, 56.0%	144, 44.0%		327	132, 47.5%	146, 52.5%		278
Socioeconomic status	Low	Middle	High		Low	Low-middle	High-middle	
First session	109, 15.9%	347, 50.6%	230, 33.5%		174, 26.6%	330, 50.4%	151, 23.0%	
Complete data	55, 16.8%	133, 40.7%	139, 42.5%		46, 16.5%	183, 65.8%	49, 17.6%	
Race	White	Nonwhite	(M.D.)		White	Nonwhite	(M.D.)	
First session	348, 52.6%	313, 47.4%	(25)		331, 51.6%	310, 48.4%	(14)	

TABLE 2 LEVELS OF PERCEIVED VULNERABILITY BY AGE (SESSION), SEX, AND SOCIOECONOMIC STATUS

Grade	Session					F	Sex*			F	Socioeconomic status*			F
	1	2	3	4	5	df	M	F	df		Low	Middle	High	df
						p			p					p
3rd														
$\bar{x}$	3.49	3.75	3.94	4.03	4.22	25.43	3.47	3.53	4.42		3.14	3.52	3.62	4.44
s.d.	1.13	1.10	1.01	1.05	.97	4/318	1.13	1.12	1/321		1.06	1.13	1.12	2/321
N	686	674	510	478	508	<.0001	376	307	<.05		109	347	230	<.02
7th														
$\bar{x}$	4.34	4.32	4.27	4.32	4.23	2.79	4.29	4.38	7.65		4.25	4.31	4.49	N.S.
s.d.	.83	.87	.85	.85	.92	4/269	.85	.82	1/272		.88	.86	.70	
N	655	647	505	462	430	<.05	326	325	<.01		174	330	151	

\*F statistics for sex and socioeconomic status are based on values at all five sessions; means are reported for first session only.

TABLE 3 OUTLINE OF ADDITIONAL DEVELOPMENTAL ANALYSES FOR 3RD GRADE

Sample	N	Level of perceived vulnerability					Change over time		Slope over time		Curve over time	
		Session					F (df=4/318)	p	F (df=1/321)	p	F (df=3/319)	p
		1	2	3	4	5						
Male, Low SES	34	3.14	3.48	3.45	3.53	3.84	2.96	.0199	7.96	.0053	.76	N.S.
Female, Low	21	3.07	3.63	4.20	4.06	4.08	5.92	.0003	14.29	.0004	3.39	.0181
Male, Middle SES	71	3.66	3.76	3.86	3.98	4.11	2.58	.0366	9.95	.0022	.02	N.S.
Female, Middle SES	62	3.82	3.79	3.93	3.73	4.49	10.92	.0001	11.60	.0011	8.88	.0001
Male, High SES	78	3.54	3.72	4.03	4.09	4.24	7.47	.0001	27.68	.0001	.86	N.S.
Female, High SES	61	3.55	4.10	4.30	4.26	4.38	8.79	.0001	23.13	.0001	3.67	.0126