Reliability of Health Belief Indexes: Confirmatory Factor Analysis in Sex, Race, and Age Subgroups

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Despite frequent reference to the Health Belief Model (HBM), few studies address the internal consistency (within questionnaires) or the stability across populations of scales used to measure HBM variables. As part of a 1983 Michigan statewide blood pressure survey, trained interviewers administered 32 health belief questionnaire items to 2,802 randomly selected adult Michigan residents. Exploratory common factor analysis was used to examine the structure of these questionnaire items. Six correlated factors, which corresponded closely with theoretical constructs, appeared. Guided by these results, we developed a confirmatory common factor model. The model's fit was examined in random population halves and in univariate sex, race, and age subgroups. Except perhaps in the oldest age group, the model's fit appeared constant. Reliabilities estimated for HBM factor scales formed with these questionnaire items appeared independent of age, race, or sex.

The Health Belief Model (HBM) is one of several psychosocial models developed to explain preventive health behavior, compliance with medical regimens, and health care utilization [1]. Although varied by dif-

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ferent writers, a widely used version of the HBM associates an individual's health behavior with five psychological variables: general health motivation, susceptibility, severity, benefits, and barriers. General health motivation is defined as the nonspecific tendency for an individual to engage, across situations, in healthful behavior. Susceptibility refers to an individual's estimate of his chance of acquiring a disease or of suffering the ill-effects of disease. Severity refers to an individual's perception of the seriousness of a given disease or of disease in general. Benefits and barriers refer to an individual's assessment of the value and cost, respectively, of alternative behaviors. Under the model, other variables (e.g., environmental cues, and sociodemographic and social support variables) are thought to affect behavior through health beliefs.

Although many published studies provide empirical support for the HBM [2], only a few have examined the formal psychometric properties of health belief indexes [3–7]. Most such methodologic studies employ specialized and nonrepresentative populations [5,6]. While some investigators compare the distribution of health beliefs among population subgroups [6,7], none confirm that the structure and reliability of health belief indexes remain invariant with respect to the variables used to characterize the subgroups.

The 1983, population-based Michigan Blood Pressure Survey included many health belief questionnaire items. In a representative and generally healthy population, this present study aimed at assessing the structure and internal consistency (i.e., reliability) of health belief measures. Further, structure and internal consistency were compared across major population subgroups. Equivalent structure and reliability are important psychometric properties if scales formed from these measures are to be used to compare mean health beliefs across population subgroups.

METHODS

The 1983 Michigan Blood Pressure Survey was designed to measure the prevalence of undiagnosed, diagnosed, treated, and controlled hypertension in the Michigan adult population and in its major sociodemographic subgroups. Other health-related information, including health beliefs, was also collected. A probability sample of Michigan households was selected by means of a stratified multistage cluster sample design. In each sampled household, one adult, 18 years or older, was randomly selected by means of the Kish selection tables [8]. Between July 1983 and March 1984, face-to-face interviews were

successfully completed in 74.4 percent of eligible households. A total of 2,802 adults were interviewed (1,184 men, 1,618 women; 73.6 percent white, 24.4 percent black, 1.9 percent other; 49.8, 27.2, and 23.0 percent aged 18–39 years, 40–59 years, and greater than 59 years, respectively).

All interviewers received standard training, which included written procedure manuals, lectures, group practice sessions, role playing, and mock interviews. Procedures were established to minimize nonresponse, missing data, coding errors, data entry errors, and falsification of interview data.

Thirty-two questionnaire items measured hypothesized HBM constructs. The questionnaire employed a closed, Likert-type format (some items without a middle category), with four to six ordinally scaled options per item. With the exception of the barriers construct, the HBM dimensions were represented by several items. In order to assess the reliability of scales formed from these questionnaire items, exploratory and confirmatory factor analytic techniques were employed. Data exploration and model building were initially performed on a random half of the study population. Exploratory common factor analysis employed the OSIRIS IV computer program package [9]. The Pearson product-moment correlation matrix was formed for the 32 HBM questionnaire items. With communalities placed in the diagonal of the correlation matrix, factors were extracted by means of the principle-axis method of Hotelling [10]. The number of factors to retain in the factor solution was determined by application of the Scree test [11]. The factor solution was examined after Varimax and Oblimin rotations.

Confirmatory factor analyses employed the LISREL VI computer program package [12]. The polychoric correlation matrix was formed for the 32 HBM questionnaire items. Polychoric correlations were felt to be more appropriate in light of the noninterval nature of the health belief measures [12]. Confirmatory common factor models, with each questionnaire item loaded singly, were specified. Since the distribution of responses to the HBM questionnaire items departed from multinormality, unweighted least-square parameter estimation (instead of maximum likelihood estimation) was employed [12].

Using the factor loading and factor correlation patterns developed for the first random population half, parameters for the same common factor model were estimated for the second random half and for univariate sex, race, and age subgroups. The adequacy and comparability of these models were assessed by examination of: (1) the parameter estimates; (2) the amount of variance, in the pool of questionnaire

items, explained by the entire model and by each common factor; (3) the reliability of factor scales formed under the model; and (4) the LISREL VI Goodness of Fit Index (GFI) [12]. The GFI, a global measure of how well the model reproduces the sample correlation matrix, approaches unity for models with good fit. Coefficient omega was employed to estimate the reliability of scales formed by simple addition of normalized questionnaire item responses [13].

RESULTS

We used exploratory factor analysis to guide development of a confirmatory common factor model, in which each hypothesized HBM questionnaire item loaded on only one factor. Then, factor loading and factor correlation estimates, percentage of variance explained by each factor and by all factors, and global measures of the model's goodness of fit were directly compared across mutually exclusive population subgroups. If such a parsimonious model fits the data adequately, then scales can be constructed with each questionnaire item contributing to only one scale [14]. Further, if the model's fit is stable across population subgroups, one can then compare each scale's reliability estimate across these subgroups.

The 32 HBM questionnaire items and the theoretical HBM dimension each represents are listed in Appendix A. Items were assigned to theoretical HBM dimensions by consensus between two authors (J. L. W. and B. M. B.) and prior to any statistical analysis. Appendix B shows the Oblimin-rotated, exploratory factor analysis solution for one random population half. Interpretation based on the Varimax rotation gave similar results. The solution contained six significant factors (Scree test). For interpretation, all factor loadings, except for each item's largest loading, were ignored. (Item 25 had large loadings on two factors. The second-highest loading, felt to have greater face validity, was retained.) These six factors were entitled, General Health Motivation/Concern, General Health Threat, Susceptibility, Severity, Benefit of Medical Care, and Self-help Benefit (benefit of self-help behaviors) (Appendix A, under Empirical Constructs). After Oblimin rotation, three factor pairs—Benefit of Medical Care and Self-help Benefit, General Health Motivation/Concern and Benefit of Medical Care, and General Health Motivation/Concern and Self-help Benefit—were modestly correlated (Appendix B).

These exploratory factor analysis results guided development of a six-factor confirmatory factor analysis model. In all models examined,

each HBM questionnaire item was forced to load only on the factor with which it associated in the exploratory factor analysis. When all 15 factor intercorrelations were allowed to vary, only four intercorrelations were large (> 0.25). Three of these four intercorrelations (Benefit of Medical Care and Self-help Benefit, General Health Motivation/Concern and Benefit of Medical Care, and General Health Motivation/Concern and Self-help Benefit) were observed in the Oblimin rotated exploratory factor analysis. In confirmatory factor analysis, General Health Motivation/Concern and Susceptibility represented a fourth large factor intercorrelation. All subsequent confirmatory factor analysis models allowed correlation between each of these four factor pairs. Correlation between any other factor pair was not allowed.

In each random population half and in univariate sex, race, and age subgroups, Table 1 shows the factor-loading estimates for the final confirmatory common factor model. Except for item 23, the only theoretical barrier item available for study, loadings for all items in all models exceeded 0.3, a level conventionally considered "important" [14].

Because a statistical test has not been developed [12], apparent differences in the magnitude of parameter estimates were interpreted cautiously. In general, factor loadings (Table 1) and factor intercorrelations (not shown for the confirmatory factor analysis models) were similar. However, in blacks compared to whites, a question measuring "blood pressure concern" (item 4) loaded on the latent Health Motivation/Concern construct more heavily than a question measuring the belief "in the importance that people take special care of their health" (item 3, Table 1). Similarly, in older age groups, questions measuring "thinking about health" (item 1) and "concern about health" (item 2) loaded on the Health Motivation/Concern construct less heavily than a question measuring the belief "in the importance that people take special care of their health" (item 3, Table 1).

In subgroup comparisons, the percent of variance explained by each factor and the percent of variance explained by all factors were construed as summary measures of the comparability of factor loadings within factors and over all factors, respectively. Generally, these measures were comparable (Table 2). In black-white comparisons, however, these measures tended to be slightly larger in blacks.

In a common-factor analysis, the Goodness of Fit Index (GFI) was construed as a global measure of how well the factors and their correlations reproduced all off-diagonal elements in the sample correlation matrix. The model appeared to deteriorate in older age groups

Table 1: Factor Loadings (Confirmatory Factor Analysis Model) for Two Random Population Halves and Sex, Race, and Age Subgroups

	1st Random Half	*2nd Random Half*	*Men*	*Women*	*Whites*	*Blacks*	*Age 18–39*	*Age 40–59*	*Age > 59*
Sample Size	1429	1373	1184	1618	2057	683	1393	761	643
General Health Motivation/Concern									
1.	0.57	0.54	0.58	0.55	0.53	0.50	0.66	0.56	0.39
2.	0.65	0.72	0.72	0.67	0.66	0.64	0.75	0.67	0.59
3.	0.67	0.78	0.75	0.65	0.80	0.34	0.67	0.72	0.82
4.	0.67	0.61	0.63	0.68	0.56	0.78	0.61	0.67	0.60
General Health Threat									
5.	0.76	0.72	0.76	0.72	0.70	0.90	0.68	0.81	0.81
6.	0.63	0.59	0.53	0.66	0.60	0.61	0.63	0.62	0.56
Susceptibility									
7.	0.38	0.36	0.36	0.37	0.33	0.48	0.39	0.38	0.35
8.	0.77	0.76	0.80	0.76	0.75	0.80	0.81	0.71	0.74
9.	0.82	0.84	0.83	0.82	0.84	0.82	0.85	0.81	0.82
10.	0.60	0.62	0.63	0.60	0.61	0.68	0.57	0.64	0.68
11.	0.56	0.54	0.59	0.53	0.54	0.66	0.55	0.53	0.63
Severity									
12.	0.85	0.85	0.85	0.85	0.85	0.84	0.89	0.83	0.79
13.	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.90	0.94
14.	0.84	0.84	0.83	0.85	0.84	0.84	0.85	0.81	0.85
15.	0.82	0.85	0.82	0.85	0.84	0.84	0.82	0.89	0.80
16.	0.41	0.36	0.38	0.38	0.39	0.36	0.42	0.34	0.37

Benefit of Medical Care									
17.	0.41	0.37	0.43	0.33	0.40	0.30	0.34	0.44	0.42
18.	0.58	0.52	0.59	0.53	0.54	0.62	0.49	0.53	0.66
19.	0.52	0.48	0.49	0.51	0.47	0.61	0.44	0.51	0.57
20.	0.63	0.70	0.64	0.70	0.65	0.68	0.65	0.63	0.72
21.	0.53	0.46	0.46	0.55	0.50	0.56	0.55	0.50	0.46
22.	0.70	0.73	0.72	0.65	0.69	0.71	0.71	0.69	0.78
23.	0.24	0.19	0.18	0.25	0.22	0.30	0.22	0.18	0.24
Self-help Benefit									
24.	0.58	0.59	0.54	0.61	0.61	0.61	0.60	0.58	0.60
25.	0.54	0.53	0.52	0.58	0.53	0.61	0.61	0.54	0.54
26.	0.58	0.63	0.57	0.62	0.62	0.58	0.56	0.63	0.66
27.	0.59	0.58	0.55	0.59	0.59	0.57	0.53	0.63	0.64
28.	0.70	0.68	0.67	0.66	0.64	0.77	0.64	0.77	0.68
29.	0.68	0.61	0.60	0.67	0.63	0.64	0.64	0.66	0.61
30.	0.65	0.62	0.61	0.65	0.67	0.65	0.65	0.64	0.61
31.	0.61	0.64	0.60	0.61	0.59	0.69	0.61	0.69	0.57
32.	0.56	0.55	0.53	0.54	0.54	0.55	0.52	0.62	0.55

Table 2: Percent of Variance (in the Pool of Questionnaire Items) Explained by Each Factor, Percent of Variance Explained by All Factors, and Goodness of Fit Index for Confirmatory Factor Analysis Models Fitted to Each of Two Random Population Halves and Sex, Race and Age Subgroups

	1st Random Half	*2nd Random Half*	*Men*	*Women*	*Whites*	*Blacks*	*Age 18-39*	*Age 40-59*	*Age > 59*
Percent of variance explained by factor									
General Health Motivation/Concern	5.16	5.96	5.71	5.07	5.25	4.30	5.68	5.42	4.80
General Health Threat	3.06	2.70	2.66	2.96	2.67	3.68	2.70	3.23	3.02
Susceptibility	6.56	6.55	7.00	6.30	6.32	7.62	6.70	6.23	6.83
Severity	9.78	9.82	9.69	9.93	9.86	9.78	10.14	9.53	9.43
Benefit of Medical Care	6.24	5.95	6.09	6.01	5.89	6.99	5.72	5.91	7.32
Self-help Benefit	10.58	10.35	9.42	10.63	10.26	11.23	10.09	11.63	10.37
Percent of variance explained by all factors	41.38	40.97	40.57	40.90	40.26	43.60	41.04	41.95	41.78
Goodness of Fit Index	0.917	0.897	0.898	0.910	0.908	0.906	0.920	0.895	0.864

(Table 2). This finding suggested that a six-common-factor model, with four correlated factor pairs and with each questionnaire item loaded singly, provided a relatively poor fit in the oldest age group.

Finally, once the model was accepted, Table 3 shows reliability estimates (coefficient omega), a measure of internal consistency, for factor scales (Appendix C) formed with questionnaire items loading on a given factor. The reliabilities were acceptable in magnitude and generally stable when examined across subgroups (Table 3). An alternative reliability coefficient based on the Spearman-Brown formula [13] gave nearly identical results.

DISCUSSION

An exploratory factor analysis of 32 health belief questionnaire items yielded a factor structure that corresponded fairly closely with the conceptual form of the Health Belief Model. That is, the health belief questionnaire items consistently loaded, in that pattern suggested by theory, on common factors with HBM interpretations. Subsequently, we formed the confirmatory common factor model suggested by the results of the exploratory factor analysis. The model's fit and the scales' estimated reliabilities appeared to be relatively independent of sex, race, and age. These findings suggested that the questionnaire items and the resulting scales represented not only internally consistent measures with respect to Health Belief Model theory, but also psychological measures of similar constructs in different sex, race, and age subgroups.

The primary purpose of this article was to examine, in different demographic subgroups, psychometric properties of health belief questionnaire items. In addition, the exploratory factor analysis solution shown in Appendix B permitted comment on the possible nature of the six factors identified. Two questionnaire items, one measuring general susceptibility, the second general severity, formed the General Health Threat dimension. In contrast, disease-specific items formed distinct susceptibility and severity dimensions. Past work has been largely ambiguous regarding the relationship between susceptibility and severity. One previous study, a factor analysis of a telephone survey of Michigan adults, produced a similar factor which combined general disease susceptibility and severity items [3]. In the study presented here, the General Health Threat factor had substantial loadings from several items having a self-help benefit interpretation. The pattern of loading suggested that individuals perceiving a greater threat from

Table 3: Reliability (Coefficient Omega) Estimated for Factor Scales (Appendix C)

	1st Random Half	*2nd Random Half*	*Men*	*Women*	*Whites*	*Blacks*	*Age 18–39*	*Age 40–59*	*Age > 59*
General Health Motivation/Concern	0.74	0.76	0.77	0.73	0.74	0.66	0.77	0.75	0.72
General Health Threat	0.65	0.60	0.59	0.64	0.60	0.73	0.60	0.68	0.64
Susceptibility	0.77	0.77	0.79	0.76	0.76	0.82	0.78	0.76	0.78
Severity	0.89	0.89	0.88	0.89	0.89	0.89	0.90	0.88	0.88
Benefit of Medical Care	0.72	0.72	0.72	0.72	0.71	0.75	0.70	0.71	0.66
Self-help Benefit	0.84	0.84	0.82	0.84	0.84	0.86	0.83	0.86	0.79

disease were less likely to perceive health value in a balanced diet or regular exercise. This observation suggested that the general disease susceptibility and severity items and several self-benefit items formed polar extremes of a dimension which represented an individual's sense of control over subsequent health.

The benefit questionnaire items formed two correlated dimensions. One dimension appeared to measure the perceived value of medical care and the medical care system. The second appeared to measure the perceived value of more personal health behaviors. Further, the General Health Motivation/Concern dimension correlated with each of the benefit dimensions. This confirmed Maiman's [4] observation, in mothers of obese children, of a similar correlation between health concern and belief in a physician's ability to cure illness.

The paucity of theoretical barrier questionnaire items in the 1983 Michigan Blood Pressure Survey severely limited our ability to determine whether benefits and barriers form separate psychological dimensions. The only barrier item (item 23, Appendix A) loaded weakly with benefit items. This observation is too weak to clarify a previous suggestion that benefits and barriers form polar extremes of a single dimension [5].

Factor analytically derived reliability estimates must be interpreted cautiously [13]. In our study, response-set bias may explain part of the observed inter-item correlations. Although the 32 HBM questionnaire items were dispersed in a 424-item questionnaire, items measuring the same theoretical HBM construct tended to use similar question formats and to appear together in the questionnaire.

Development of a standard, flexible, widely useful instrument to measure HBM variables has not been fruitful. In part, this is because of the need to target the content of questionnaires to specific health behaviors, disease states, and populations. Most studies, in fact, do not examine the degree to which the theoretical components are represented in the actual measures. We were able to identify only eight published studies which addressed the psychometrics of health beliefs [3-7, 15-17]. Several, however, incorporated constructs (e.g., locus of control, social support) not conventionally considered health beliefs [6,15]. Populations studied included random samples of healthy adults [3,15] or children [7], mothers of obese children [4], diabetics [17], and availability samples (e.g., hospital employees [6] and graduate students [5]). Most employed factor-analytic methods to develop internally consistent scales with acceptable reliabilities. Only two studies validated results in a second sample [3,17]. On very small nonrandom

subsamples, only two studies examined the instrument's test-retest reliability [6,16]. Without examining the scales' appropriateness in different population subgroups, two studies examined the manner in which values for factor scales were distributed according to age, sex, marital status, or education [6,7]. Thus, only limited information has been available concerning measurement issues in research on health beliefs. This article represents an initial step toward the development of standard health belief scales which generalize for men and women, blacks and whites, and perhaps different age groups.

APPENDIX A

HBM QUESTIONNAIRE ITEMS

	Theoretical Construct	*Empirical Construct*
1. How often do you think about your health?	Motivation	Motivation/ Concern
2. How concerned are you about your health?	Motivation	Motivation/ Concern
3. How important do you think it is that people take special care of their health?	Motivation	Motivation/ Concern
4. How concerned are you about the possible future effects of high blood pressure on your health? How concerned are you about health problems that high blood pressure could cause for you?*	Motivation	Motivation/ Concern
5. Compared to other people your age, would you say that you get sick much more often, more often, as often, less often, or much less often?	Susceptibility	General Health Threat
6. Compared to other people your age, when you do get sick, would you say you get much more sick, more sick, as sick, less sick, or much less sick?	Severity	General Health Threat
7. How likely do you think it is that you will get high blood pressure sometime in your life? One year from now, how likely do you think it is that you will have elevated blood pressure levels where your pressure is not in good control?*	Susceptibility	Susceptibility
8. How likely is it that you will have a heart attack in the future?	Susceptibility	Susceptibility
9. How likely is it that you will have a stroke in the future?	Susceptibility	Susceptibility

Continued

Appendix A: Continued

	Theoretical Construct	*Empirical Construct*
10. How likely is it that you will have kidney disease in the future?	Susceptibility	Susceptibility
11. How likely is it that you will have cancer in the future?	Susceptibility	Susceptibility
12. How serious a health problem would high blood pressure be for you? How serious a health problem do you think high blood pressure will be for you in the future?*	Severity	Severity
13. How serious a health problem would having a heart attack be for you?	Severity	Severity
14. How serious a health problem would having a stroke be for you?	Severity	Severity
15. How serious a health problem would having kidney disease be for you?	Severity	Severity
16. How serious a health problem would having cancer be for you?	Severity	Severity
17. Overall, how helpful are doctors when you are ill?	Benefit	Benefit of Medical Care
18. Overall, how effective do you think medical treatment is in preventing illness from the effects of high blood pressure?	Benefit	Benefit of Medical Care
19. More specifically, how effective do you think blood pressure medicines are in preventing illness from the effects of high blood pressure?	Benefit	Benefit of Medical Care
20. What about special diets?	Benefit	Benefit of Medical Care
21. What about exercise programs for high blood pressure?	Benefit	Benefit of Medical Care
22. How important do you think controlling high blood pressure is?	Benefit	Benefit of Medical Care
23. Overall, how easy or difficult is it to get medical care when you want it?	Barrier	Benefit of Medical Care
"Now I'll read you a list of things some people think help their health. Tell me if you think each one I read helps a person's health a great deal, a large amount, a fair amount, a little, or if it doesn't help at all."		
24. . . . eating a balanced diet?	Benefit	Self-help Benefit
25. . . . getting regular physical activity?	Benefit	Self-help Benefit
26. . . . being at the ideal weight for a person's height?	Benefit	Self-help Benefit
27. . . . avoiding getting tense and anxious?	Benefit	Self-help Benefit

Continued

Appendix A: Continued

	Theoretical Construct	*Empirical Construct*
28. . . . getting regular medical checkups?	Benefit	Self-help Benefit
29. . . . getting the right amount of sleep?	Benefit	Self-help Benefit
30. . . . avoiding cigarettes?	Benefit	Self-help Benefit
31. . . . avoiding alcohol?	Benefit	Self-help Benefit
32. . . . leading a spiritually good life?	Benefit	Self-help Benefit

*Alternative questionnaire item for respondents reporting a history of high blood pressure.

APPENDIX B

EXPLORATORY FACTOR ANALYSIS SOLUTION, SIX FACTORS, OBLIMIN ROTATION, FIRST RANDOM POPULATION HALF

The factor pattern and the factor intercorrelation matrixes follow. Only factor loadings with values greater than 0.175, in absolute value, are shown.

	Factor					
Questionnaire Items	*Motivation Concern*	*Threat*	*Susceptibility*	*Severity*	*Medical Benefit*	*Self-help*
1. Health think	0.58					
2. Health concern	0.74					
3. Special care	0.28					
4. BP concern*	0.50					
5. Sick often		-0.34	0.25			
6. Sick severe		-0.23	0.23			
7. HTN likely			0.38			
8. MI likely			0.72			
9. Stroke likely			0.75			
10. Kid dis likely			0.52			
11. Cancer likely			0.50			
12. HTN serious				0.73		
13. MI serious				0.83		
14. Stroke serious				0.74		
15. Kid dis serious				0.66		
16. Cancer serious	0.24			0.29		
17. Doctors helpful		-0.18			0.25	
18. Medical treatment					0.71	
19. BP medicines					0.70	
20. Prescr diet					0.42	
21. Prescr exercise		0.30			0.38	

Continued

Appendix B: Continued

Questionnaire Items	*Factor*					
	Motivation Concern	*Threat*	*Susceptibility*	*Severity*	*Medical Benefit*	*Self-help*
22. BP control					0.18	
23. Care barrier					0.18	
24. Diet		0.35				0.39
25. Exercise		0.45				0.39
26. Ideal weight		0.19				0.47
27. Anxiety		0.19				0.48
28. Checkups	0.18				0.19	0.46
29. Sleep						0.57
30. Cigarettes						0.53
31. Alcohol						0.59
32. Good life						0.49

	Motivation Concern	*Threat*	*Susceptibility*	*Severity*	*Medical Benefit*	*Self-help*
Motivation/Concern	1.00	0.02	0.09	0.08	0.11	0.20
Threat		1.00	-0.01	0.02	0.03	0.01
Susceptibility			1.00	0.06	-0.01	0.03
Severity				1.00	0.05	0.10
Medical Benefit					1.00	0.26
Self-help Benefit						1.00

*BP = blood pressure; HTN = hypertension; MI = myocardial infarction; kid dis = kidney disease; prescr = prescribed.

APPENDIX C

HEALTH BELIEF SCALES

Each scale is scored by summing the items indicated. Before summation, each item is standardized against its mean and standard deviation. Means and standard deviations provided were not weighted to reflect the study's sample design. Sample sizes used to estimate means and standard deviations vary because of missing responses.

Questionnaire Item	*Sample Size*	*Range*	*Mean*	*Standard Deviation*
Motivation/Concern				
1. Health think	2794	1-6	2.91	1.26
2. Health concern	2791	1-4	1.65	0.82
3. Special care	2792	1-4	1.14	0.41
4. BP concern	2773	1-4	1.87	1.03

Continued

Appendix C: Continued

Questionnaire Item	Sample Size	Range	Mean	Standard Deviation
Threat				
5. Sick often	2724	1-5	3.92	0.92
6. Sick severe	2681	1-5	3.45	1.00
Susceptibility				
7. HTN likely	2617	1-4	2.62	0.91
8. MI likely	2590	1-4	2.85	0.87
9. Stroke likely	2579	1-4	2.91	0.82
10. Kid dis likely	2603	1-4	3.04	0.80
11. Cancer likely	2535	1-4	2.76	0.89
Severity				
12. HTN serious	2687	1-4	2.01	0.97
13. MI serious	2690	1-4	1.33	0.70
14. Stroke serious	2702	1-4	1.25	0.62
15. Kid dis serious	2694	1-4	1.40	0.75
16. Cancer serious	2708	1-4	1.23	0.61
Benefits of Medical Care				
17. Doctors helpful	2761	1-4	1.56	0.74
18. Medical treatments	2639	1-4	1.63	0.67
19. BP medicines	2571	1-4	1.57	0.65
20. Prescribed diet	2670	1-4	1.50	0.64
21. Prescribed exercise	2559	1-4	1.68	0.76
22. BP control	2782	1-4	1.08	0.31
23. Care barrier	2772	1-4	1.70	0.74
Self-help Benefit				
24. Diet	2789	1-5	1.45	0.76
25. Exercise	2783	1-5	1.53	0.80
26. Ideal weight	2768	1-5	1.74	0.91
27. Anxiety	2768	1-5	1.70	0.95
28. Checkups	2780	1-5	1.82	1.03
29. Sleep	2783	1-5	1.75	0.89
30. Cigarettes	2753	1-5	1.41	0.80
31. Alcohol	2752	1-5	1.85	1.03
32. Good life	2748	1-5	2.07	1.24

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