Multidimensional Health Locus of Control in American Indians: The Strong Heart Study

Objective: Observe and record the demographic and anthropomorphic correlates of health beliefs in American Indians using the multidimensional health locus of control (MHLC) scale.

Design: Self-administration or interview rating of Form B of the MHLC scale.

Setting: Arizona, Oklahoma, and Dakota branches of The Strong Heart Study

Participants: 3665 participants (1468 men and 2197 women) aged 15 to 93 years (average 39.9) of Phase IV of The Strong Heart Study.

Main Outcome Measures: MHLC subscale scores, demographics, anthropometrics

Results: *Demographics*: Women had higher Chance health locus of control (HLC) than men, but otherwise similar MHLC scores. Age positively correlated with lower Internal HLC and higher Powerful Others HLC. Education was associated with lower Chance HLC. MHLC scores differed by center (AZ, OK, and SD). *Anthropometrics*: Men with high body fat or high waist-to-hip ratio had higher Powerful Others HLC. Waist-to-hip ratio in women positively correlated to Powerful Others HLC and Chance HLC. BMI was not a strong indicator of differences in MHLC.

Conclusions: To our knowledge, this is the first study to examine health locus of control in American Indians. The health beliefs of American Indians in this study were similar to previous demographic studies in other populations. The associations between certain health beliefs and obesity deserve further exploration to gauge prospective risk. Clinicians should continue to identify psychological issues and counsel American Indian patients in culturally sensitive ways for improved preventive care delivery and increased efficacy of health education. (*Ethn Dis.*2009;19:338–344)

Key Words: Health Beliefs, Multidimensional Health Locus of Control, American Indians, The Strong Heart Study

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Introduction

Health locus of control (HLC) is a construct that refers to how individuals perceive the sources regulating their health.[1] A product of Rotter's social learning theory, early HLC studies measured these beliefs on a solitary Internal-External axis.[2] This scale of health beliefs ranged from Internal HLC, where control for one's health resides within the individual, to External HLC, relative powerlessness where control is external to the individual. The multidimensional health locus of control (MHLC) construct is an improvement over the classic conceptualization; it measures health beliefs with a tripartite approach by differentiating External HLC into Powerful Others HLC (eg, physicians) and Chance HLC.[3] Strong Internal HLC, then, reflects personal responsibility for affecting health status, strong Powerful Others HLC reflects dependency on others, and strong Chance HLC reflects loss of agency to fortune. These three dimensions are traditionally treated as independent factors, though studies have revealed modest between-factor correlations.[4,5] Individual life experiences are thought to determine one's scores on each of these MHLC subscales. The acceptable validity and reliability of the MHLC scale have been well-documented over its 30-year history.[6,7]

The utility of MHLC research comes from the theorized relation of health beliefs to health behaviors and, consequently, health outcomes. Much of the literature linking health beliefs and health outcomes used the bi-dimensional construct and not the more recent MHLC. Previous studies associated External HLC with negative cardiovascular health, such as hypertension and non-adherence to preventive strategies.[8,9] Since hypertension is a treatable risk factor for complications of cardiovascular disease (CVD) and diabetes, it is thought that better understanding of MHLC may enable clinicians to tailor their counseling to suit their patients' health beliefs.

MHLC is thought of as a relatively stable measure in a healthy population. No longitudinal studies have evaluated whether MHLC changes with health status, though MHLC has been observed to vary by health status.[10] An adaptable, condition-specific form of the MHLC has been adopted for studying heath beliefs in such patients.[11] Patients with epilepsy, spinal cord injury or chronic fatigue syndrome perceive weaker internal and stronger external health control compared to a healthy population.[12–14] This response pattern can be viewed as a coping response to a dramatic change from normal health status. In patients with chronic kidney disease, decrease in Internal HLC over time has been linked to development of depression, perhaps due to the incongruence of health beliefs and objective circumstances of the disease.[15,16] Though population-based studies often consider MHLC a stable trait, a practical application of MHLC is found in the setting of

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customized patient education. Thus, population-based MHLC studies should serve as an entry point to eliciting and understanding the health beliefs from patients.

In addition to personal health history, a myriad of societal, cultural and religious factors are reflected in MHLC. For example, societies that value individual choice over family or community volition may rate higher Internal HLC; societies distrustful of allopathic medicine may rate lower Powerful Others HLC; and fatalist societies may score higher Chance HLC.[17] Few studies have directly compared cultural variation in MHLC, partly due to the need for transliteration and validation of the same MHLC form in diverse populations.

Older HLC studies have also highlighted population differences in health beliefs. Previous research has shown that low socioeconomic status, female sex, non-White ethnicity, old age and low education are associated with increased External HLC.[18,19] Among populations known for health disparities, American Indians have high incidences of CVD and diabetes, conditions that have important behavioral components for treatment and prevention.[20–23] Tobacco use, a behavioral risk factor for CVD, diabetes, and other health problems, is also high among most American Indian tribes. Use of MHLC may prove an important step in learning how best to combat health disparities seen in American Indians.

The purpose of this study was to investigate the demographic and anthropometric correlates of the MHLC subscales in American Indians using data from Phase IV of The Strong Heart Study. To our knowledge, no studies have previously addressed MHLC in American Indians.

METHODS

Our study analyzed 3665 participants (1468 men and 2197 women) aged 15 to 93 years (mean 39.9 years) from Phase IV of The Strong Heart Study using Form B of the MHLC.[1] Participants were relatives of the original Strong Heart Study cohort, and detailed protocols have been published previously.[24,25] We analyzed participant statements that corresponded to the following three subscales: Internal HLC (eg, "I have the power to make myself well"), Powerful Others HLC (eg, "Health professionals keep me healthy"), and Chance HLC (eg, "No matter what I do, if I am going to get sick, I will get sick"). Twelve participants were excluded from the analysis because of problematic data on the MHLC. The data from the remaining 3653 questionnaires were analyzed using SPSS 16.0 (SPSS, Chicago, Ill.).

Reliability and Validity

Internal consistency reliability coefficients (Cronbach's alpha) were acceptable at 0.66, 0.67, and 0.58 for Internal HLC, Powerful Others HLC, and Chance HLC, respectively. Typically, the alphas for the MHLC range from 0.60 to 0.75.[1,6–9,26]

Administration

This scale was rated by participants through either self-administration or interview with staff member. Each item was answered on a 4-point Likert scale where "strongly disagree" was 0, "disagree" was 1, "agree" was 2, and "strongly agree" was 3.

Scoring

The score on each subscale (Internal HLC, Powerful Others HLC, and Chance HLC) was the sum of the values for each of the six items on the subscale. The subscales are treated as independent factors; there is no composite MHLC score. Higher subscale indices reflect stronger perception of control in the given dimension.

Education was analyzed by creating discrete variables: less than high school (<12 years), high school (12 years), post-secondary (13 to 15 years), and college graduate or higher (16+ years). The clinical classifications of body mass index (BMI) were used to analyze MHLC subscales: underweight (<18.5), normal (18.5 to <25), overweight (25 to <30), obese (30 to <35), clinically obese (35 to <40), and morbidly obese (40+). The American Council on Exercise categorizations of body fat percentages were used: fitness (women, <25%; men, <18%), acceptable (women, 25% to 32%; men, 18% to 25%), and obese (women, >32%; men, >25%).

The associations between the subscale HLC scores and demographics and anthropometric measurements were examined. When two groups were compared, 2-tailed independent samples t tests were used. With three groups, one-way analysis of variance (ANOVA) tests were used. Results were considered significant if $P \leq .05$. Listed correlation coefficients were significant at $P < .01$.

RESULTS

Tables 1 and 2 summarize the MHLC results for demographic and anthropometric correlates, respectively. Respondents utilized the full range (0 to 18) of possible scores on each HLC subscale. Of the MHLC subscales overall, Internal HLC scores were highest (12.51 ± 2.46). Chance HLC scores (8.29 ± 2.61) and Powerful Others HLC (8.87 ± 2.89) were lower and positively correlated ($r = 0.36$).

Table 1. Demographic characteristics of MHLC in American Indians participating in the Strong Heart Study

	Internal HLC		Powerful Others HLC		Chance HLC	
	n **(%)**	**Mean (SD)**	***n*** **(%)**	**Mean (SD)**	***n*** **(%)**	**Mean (SD)**
Total	3601 (100)	12.51 (2.46)	3599 (100)	8.87 (2.89)	3599 (100)	8.29 (2.61)
Gender						
Men	1434 (39.8)	12.59 (2.43)	1433 (39.8)	8.92 (2.96)	1433 (39.8)	8.14 (2.52)
Women	2167 (60.2)	12.46 (2.48)	2166 (60.2)	8.83 (2.84)	2166 (60.2)	8.39 (2.67)*
Age						
15–24	875 (24.3)	12.49 (2.50)	875 (24.3)	8.57 (2.91)	875 (24.3)	8.38 (2.60)
25–44	1471 (40.8)	12.76 (2.43)	1470 (40.8)	8.39 (2.75)	1470 (40.8)	8.30 (2.59)
45–64	933 (25.9)	12.31 (2.47)	933 (25.9)	9.32 (2.85)†	933 (25.9)	8.08 (2.59)
≥65	322 (8.9)	12.02 (2.37)	321 (8.9)	10.56 (2.71)†	321 (8.9)	8.60 (2.79)
Education						
Less than high school	1326 (37.0)	12.31 (2.51)	1324 (37.0)	9.10 (2.91)	1324 (37.0)	8.83 (2.63)
High school	1274 (35.6)	12.51 (2.38)	1274 (35.6)	8.85 (2.84)	1274 (35.6)	8.31 (2.49)†
Post secondary	707 (19.7)	12.89 (2.47)	707 (19.7)	8.59 (2.86)	707 (19.7)	7.65 (2.56)†
College graduate	274 (7.7)	12.57 (2.36)	274 (7.7)	8.52 (2.93)	274 (7.7)	7.04 (2.48)†
Center						
Arizona	1214 (33.7)	12.57 (2.51)†	1214 (33.7)	9.08 (2.84)†	1214 (33.7)	8.59 (2.58)†
Oklahoma	1203 (33.4)	12.22 (2.40)†	1201 (33.4)	9.00 (2.92)†	1201 (33.4)	7.96 (2.62)†
South Dakota	1184 (32.9)	12.75 (2.45)†	1184 (32.9)	8.52 (2.87)†	1184 (32.9)	8.31 (2.60)†

Abbreviations: MHLC, multidimensional health locus of control; HLC, health locus of control; SD, standard deviation.
* Significant 2-tailed independent samples t-test.
† Significant one-way analysis of variance (ANOVA) test.

Correlations were found between Powerful Others HLC and Internal HLC (r=0.14) and Internal HLC and Chance HLC (r=0.06).

Demographic Factors

Although women (n=2166) reported significantly higher subscale Chance HLC than men (n=1433) (P<.01), we found no difference between men and women for Internal HLC (P=0.14) or Powerful Others HLC (P=0.36) subscales.

Age was positively associated with Powerful Others HLC (r=0.20) and a weak, inverse association was found with Internal HLC (r=−0.06). When MHLC scores were examined by age category (young [under aged 25 years]; adult [aged 25 to 44 years]; mature adult [aged 45 to 64 years]; and elderly, [aged 65 years and older]), the two older adult groups showed progressively higher Powerful Others HLC scores (Figure 1).

The number of participants was similar in the three centers: Arizona (AZ, n=1214), Oklahoma (OK, n=1203), and South Dakota (SD, n=1184). HLC subscales differed slightly by center (P<.01 for each subscale). Years of education were inversely related to Chance HLC scores (P<.05) and were not associated with Internal HLC or Powerful Others HLC scores (Figure 2).

Anthropometric Factors

For men, BMI was associated with Internal HLC with higher scores in overweight men and clinically and morbidly obese men (P<.05). However, post-hoc Bonferroni analyses revealed no significant differences between categorized BMI groups. The lack of differences persisted when condensing BMI categories into healthy (BMI <25), overweight (25–30), and obese (>30). For women, a trend was observed associating higher BMI with higher Chance HLC, though it did not reach statistical significance (P=.083).

Post-hoc Bonferroni analyses revealed obese men had higher Powerful Others HLC scores (9.03 ± 2.834) than men with the lower body fat percentages: fitness (8.69 ± 3.442) or acceptable (8.54 ± 3.192) (P<.05). In women, waist-to-hip ratio was positively correlated with Powerful Others HLC (r=0.13) and Chance HLC (r=0.08) scores. In men, a similar relationship was found between waist-to-hip ratio and Powerful Others HLC (r=0.11).

DISCUSSION

MHLC has been shown to form "part of the pathway between individual and neighborhood socio-economic status and health," [27] indicating it may

In this group of American Indians, sex, age, and education were associated with MHLC.

Table 2. Anthropometric characteristics of MHLC in American Indians

	Internal HLC		Powerful Others HLC		Chance HLC	
	n (%)	Mean (SD)	*n* (%)	Mean (SD)	*n* (%)	Mean (SD)
BMI						
Men	1416 (100)	12.59 (2.43)	1415 (100)	8.92 (2.96)	1415 (100)	8.13 (2.51)
<18.5	18 (1.3)	12.78 (2.07)	18 (1.3)	10.50 (2.38)	18 (1.3)	9.00 (2.45)
18.5–25	250 (17.7)	12.36 (2.48)	250 (17.7)	8.72 (3.04)	250 (17.7)	8.28 (2.39)
25–30	408 (28.8)	12.79 (2.25)	408 (28.8)	8.78 (2.97)	408 (28.8)	8.34 (2.66)
30–35	351 (24.8)	13.30 (2.60)	350 (24.8)	9.11 (3.00)	350 (24.8)	7.98 (2.44)
35–40	206 (14.5)	12.68 (2.27)	206 (14.5)	8.97 (2.84)	206 (14.5)	7.89 (2.40)
40+	183 (12.9)	12.92 (2.51)	183 (12.9)	8.91 (2.89)	183 (12.9)	7.92 (2.58)
Women	2156 (100)	12.47 (2.48)	2155 (59.8)	8.83 (2.84)	2155 (59.8)	8.39 (2.67)
<18.5	15 (0.7)	13.60 (2.95)	15 (0.7)	9.00 (3.59)	15 (0.7)	8.73 (2.34)
18.5–25	332 (15.4)	12.37 (2.30)	332 (15.4)	8.82 (2.97)	332 (15.4)	8.15 (2.84)
25–30	502 (23.3)	12.51 (2.40)	502 (23.3)	8.83 (2.92)	502 (23.3)	8.41 (2.68)
30–35	555 (25.7)	12.45 (2.53)	554 (25.7)	8.94 (2.79)	554 (25.7)	8.35 (2.66)
35–40	388 (18.0)	12.52 (2.43)	388 (18.0)	8.63 (2.72)	388 (18.0)	8.30 (2.67)
40+	364 (16.9)	12.41 (2.70)	364 (16.9)	8.87 (2.76)	364 (16.9)	8.74 (2.51)
Percent body fat						
Men	1398 (100)	12.61 (2.42)	1397 (100)	8.91 (2.96)	1397 (100)	8.13 (2.52)
<18	99 (7.1)	12.41 (2.74)	99 (7.1)	8.69 (2.53)	99 (7.1)	8.26 (2.83)
18–25	278 (19.9)	12.60 (2.37)	278 (19.9)	8.54 (3.19)†	278 (19.9)	8.29 (2.42)
25+	1021 (73.0)	12.64 (2.41)	1020 (73.0)	9.03 (2.83)†	1020 (73.0)	8.07 (2.51)
Women	2146 (100)	12.47 (2.48)	2145 (100)	8.83 (2.84)	2145 (100)	8.39 (2.67)
<25	57 (2.7)	12.65 (2.55)	57 (2.7)	8.19 (3.03)	57 (2.7)	8.25 (2.34)
25–32	176 (8.2)	12.35 (2.27)	176 (8.2)	9.05 (2.99)	176 (8.2)	8.44 (2.86)
32+	1913 (89.1)	12.47 (2.50)	1912 (89.1)	8.83 (2.81)	1912 (89.1)	8.39 (2.67)

Abbreviations: MHLC, multidimensional health locus of control; HLC, health locus of control; SD, standard deviation; BMI, body mass index.
† Significant one-way analysis of variance (ANOVA) test.

help to partially explain current health disparities. Our study found interesting demographic and anthropometric correlates of MHLC indices that largely confirm previous MHLC demographic studies while laying a baseline for future studies in American Indians.[28]

In this group of American Indians, sex, age, and education were associated with MHLC. Overall, women reported higher Chance HLC than men. Older adults had higher Powerful Others HLC and lower Internal HLC than their younger counterparts. Individuals with increasingly higher education exhibited progressively lower Chance HLC. All of these findings are consistent with previous studies performed in other populations, except men did now show a significantly higher Internal HLC than women in our study.[18,19] MHLC subscale intercorrelations were slightly higher in our study population than the original study.[7]

Anthropometric measurements were also associated with MHLC subscales. Men with higher waist-to-hip ratios and percent body fat had higher Powerful Others HLC. Women with higher waist-to-hip ratios had higher Powerful Others HLC and higher Chance HLC. A complex association between BMI and Internal HLC existed in men, though no trends survived post-hoc analyses. BMI and percent body fat were not associated with MHLC subscales in women. Comparable anthropometric measurements do not exist in previous studies.

The physician should be aware of health beliefs in addition to illness course of any given patient and appropriately manage expected changes in health status and health beliefs to achieve congruence. Armed with the knowledge of how a patient thinks about his or her health, the physician can address individual health beliefs when negotiating the treatment plan. This teamwork is of particular importance given that MHLC changes with diagnosis of chronic illness or other change in health status.[10] Incorporating individual condition-specific health beliefs into therapy may increase patient morale, coping, and adherence to treatment strategies.

A criticism of the MHLC construct is that its factors are not as valid in practice as in theory. Overall construct validity is generally accepted despite correlations between the subscales, provided health condition-specific adjustments have been made.[7] To improve validity, other forms have subdivided Powerful Others HLC into God HLC, Doctors HLC, and Others HLC.[10] It has been suggested that the Internal HLC subscale can also be further divided into other dimensions to improve validity.[29] Continued refinement of the MHLC subscales is an

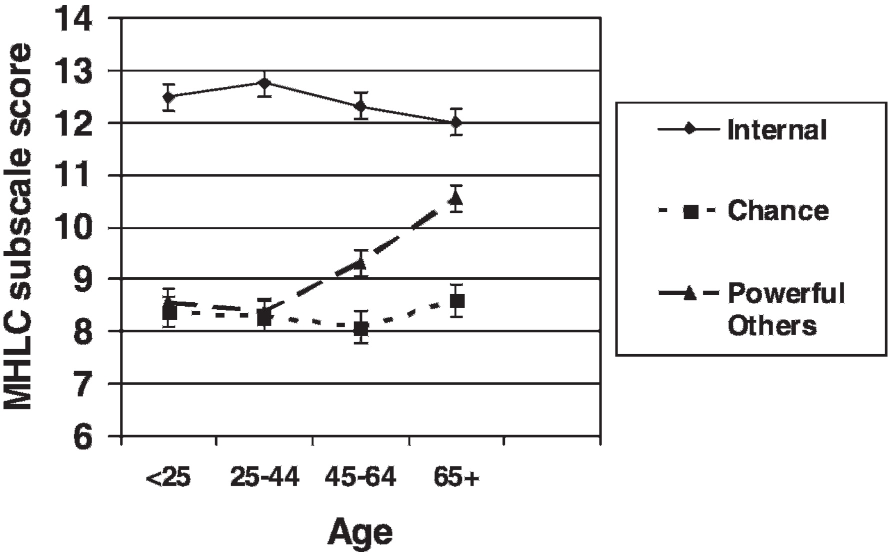

Fig 1. Mean HLC subscale scores by age group. Error bars are 95% confidence intervals of the mean. One-way ANOVA revealed significant difference among Internal HLC (diamonds, solid line), Chance HLC (squares, dotted line), and Powerful Others HLC (triangles, dashed line) by age (*P*<.01). Note the dramatic trend of older adults having higher Powerful Others HLC scores

important next step in the study of health beliefs.

The health beliefs of the American Indians studied here are remarkable in their overall similarity to previous studies of other populations. One potential reason for the lack of difference is that our study population does not host greatly different health beliefs than the previously studied populations.

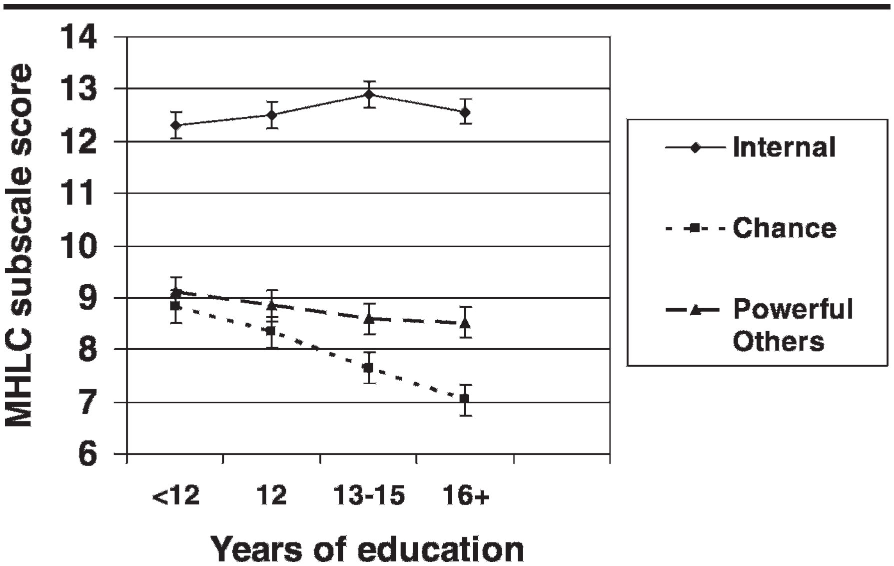

Fig 2. Mean HLC subscale scores by education. Error bars are 95% confidence intervals of the mean. One-way ANOVA revealed significant difference among Internal HLC (diamonds, solid line), Chance HLC (squares, dotted line), and Powerful Others HLC (triangles, dashed line) by years of education (*P*<.001). Note the trend for reduced Chance HLC with increased education

This possibility may seem surprising given the aforementioned health disparities. The health beliefs of American Indians in The Strong Heart Study may show greater resemblance to European-descendent populations due to years of proximity in the United States. Efforts to increase participation of tribes in traditional Western medicine by local and federal entities may also have a converging influence on health beliefs in native and non-native populations. Another possibility is that different groups may interpret MHLC questions in ways not envisioned by its authors who did not design it for cross-cultural studies.[17]

Perhaps the greatest challenge of this report for clinicians is in the difficulty of directly relating our findings to specific patient populations. Minor, though statistically significant, trends are found among study centers (ie, tribes), but the variation within centers (ie, standard deviation) is also considerable (Table 1). Healthcare providers should be sensitive to these levels of diversity and give due consideration when approaching clinical scenarios with these data.

A limitation of this cross-sectional MHLC study is that no causal relationships regarding demographic and anthropometric factors can be concluded. While it may appear that with increasing chronological and academic age, respondents learned they relied more on 'powerful others' such as healthcare professionals, had less personal agency in their health, and were no longer victims of chance, only the aforementioned correlational and descriptive epidemiological observations are supported by the data. Also, though the data presented in this study come from a large, diverse sample of American Indians, the study may not be representative of all American Indians. Since the participants are family members of the original Strong Heart Study cohort, they may not be representative of their tribes.

Change in health status is associated with change in health beliefs, as discussed above. A concern that remains unclear is whether otherwise healthy populations with certain health beliefs are at higher risk for future morbidity or mortality. Until robust evidence emerges linking MHLC to health outcomes, the presence of any health risk for various health beliefs will remain uncertain. Our present study showed that certain health beliefs are associated with current obesity, but did not address the prospective risk of developing obesity or other health outcomes. As such, this study cannot determine the role, if any, health beliefs play in modulating health risks. It would also be helpful to know the magnitude of influence, if any, that interaction with healthcare professionals has on modulating individual health beliefs, a topic not yet broached in the literature.

It is important to note that our results are not easily compared side-by-side to another study population. Though the demographic trends in our study may seem unremarkable given previous data in other populations, actual mean differences between native and non-native groups may be considerable. We acknowledge the difficulty of directly examining cross-cultural variations in MHLC and encourage future work in this arena. Given the lack of prior MHLC studies in the American Indian population, these findings should lay the foundation for future research. Future research studying MHLC and health measurements related to diabetes and CVD may prove enlightening for American Indian health.

The ultimate goal of this MHLC research is the improvement of health in American Indian communities. Identification of psychological issues and promotion of culturally sensitive counseling are examples of possibilities for improved preventive interventions and increased efficacy of health education. Individuals with identifiable risk factors would benefit from education and motivation to maximize the benefits of preventive and therapeutic interventions. Healthcare providers in American Indian communities need to be aware of the locus of control of their patients to more effectively counsel them, while remaining nonjudgmental to the health beliefs of their patients.

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