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Geographical Access and the Substitution of Traditional Healing for Biomedical Services in Two American Indian Tribes

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Abstract

Objectives—American Indians who live in rural reservation communities face substantial geographic barriers to care that may limit their use of health services and contribute to their well-documented health disparities. The purpose of this study was to examine the impact of geographical factors in access to care on the use of services for physical and mental health problems and to explore American Indians' use of traditional healing services in relation to use of biomedical services.

Methods—We analyzed survey data collected from two tribes (Southwest and Northern Plains). Geographical access to the closest biomedical service was measured using a Geographic

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Information System, including road travel distance, elevation gain and reservation boundary crossing.

Results—Use of biomedical services was unaffected by geographical access for Northern Plains tribal members with mental health problems and for Southwest tribal members with physical or mental health problems. For members of the Northern Plains tribe with physical health problems, travel distance (p=0.007) and elevation gain (p=0.029) significantly predicted a lower likelihood of service use. The use of traditional healing was unrelated to biomedical service use for members of the Northern Plains tribe with physical or mental health problems and for members of the Southwest tribe with physical health problems. For members of the Southwest tribe with mental health problems, the use of biomedical services increased the likelihood of using traditional healing services.

Conclusions—Findings suggest that biomedical services are geographically accessible to most tribal members and that tribal members are not substituting traditional healing for biomedical treatments because of poor geographical access.

Keywords

American Indians; geographical accessibility; traditional healing

INTRODUCTION

Like other rural populations,[1–9] many American Indians face geographic barriers to care such as long travel distances, difficult terrain, and poor roads.[10] A third of American Indians live in rural or reservation areas,[11, 12] and geographical barriers are particularly important to this population. Moreover, because American Indians are much more likely to report that obtaining transportation to the doctor's office is a problem compared to Caucasians,[13, 14] geographic barriers may represent an even greater impediment to seeking care. While it has been well documented that American Indians have lower rates of service utilization than Caucasians,[12] no studies have examined whether geographic barriers contribute to this health disparity.[11]

Traditional healing predates biomedical treatments in American Indian cultures and is an important element of family, community and spiritual life.[15] Use of traditional healers is common for both physical and mental health problems.[16–20] There is evidence that alternative medicine and biomedical treatments are substitutes for one another in the general population.[21] (The economic term "substitute" is defined in the methods section.) However, it is not clear whether American Indians with poor geographical access to biomedical services choose to seek care from traditional healers instead of seeking biomedical care, or whether these treatment-seeking decisions are made independently.

Therefore, we examined the impact of geographical access on the use of biomedical and traditional services for physical and mental health problems among American Indians, and explored the relationship between the use of traditional healers and biomedical services. We hypothesized that American Indians facing greater geographical barriers to biomedical services (including road travel distance, changes in elevation, having to leave the reservation, and poor road conditions) are less likely to use biomedical services compared to those with fewer of these barriers. We also hypothesized that American Indians who are able to obtain care from biomedical providers are less likely to seek care from traditional healers.

METHODS

Study Design and Sample

We analyzed cross-sectional data from the American Indian Service Utilization and Psychiatric Epidemiology Risk and Protective Factors Project (AI-SUPERPFP).[18, 22, 23] The survey was fielded from 1997 to 1999 and collected data from members of two American Indian tribes regarding their demographics, beliefs, health status, and service utilization. The two culturally-distinct tribes represent both the diversity and the common experiences of American Indians. To protect the confidentiality of the participating communities, one in the Southwest and one in the Northern Plains, we refer to these tribes by general descriptors rather than by specific tribal names. Both are among the larger tribes in the United States, experience widespread poverty, and share similar colonial histories. Study participants, age 15 to 54 who lived on or within 20 miles of their reservation, were randomly sampled from tribal rolls. From the Southwest tribe, 73.7% (n=1446) of eligible subjects agreed to participate, as did 76.8% (n=1638) of eligible subjects from the Northern Plains tribe. In contrast to a previous analysis of service utilization by Novins with the full sample (1,446 in Southwest tribe and 1,638 in the Northern Plains tribe),[18] we examined just those with self-reported physical health and mental health disorders, whom we considered to be in need of care. The physical health sub-sample included 711 (49.2%) members of the Southwest tribe and 793 (48.4%) members of the Northern Plains tribe with chronic physical health disorders in the past year such as diabetes, asthma, tuberculosis, and high cholesterol. The mental health sub-sample included 248 (17.2%) members of the Southwest tribe and 333 (20.3%) members of the Northern Plains tribe who met DSM-IV diagnostic criteria in the past year for any substance dependence/abuse disorder, any anxiety disorder, or any mood disorder according to the Composite International Diagnostic Interview (CIDI).[24]

Dependent Variables

Members of both tribes had access to free services provided by the IHS or the tribes themselves on the reservations. Some tribal members also sought care from Veterans Administration facilities and from other providers located on and off the reservations. However, at the time AI-SUPERPFP data were collected, the IHS was the predominant provider of biomedical services for both physical and mental health disorders. Use of services was measured from self-report separately for IHS, VA, and other biomedical providers and then combined into a summary indicator of biomedical service use. We did not distinguish between primary care and specialty care, because the majority of available services were primary care. Interview questions queried past-year service use, and differentiated between service use for physical health and mental health problems (labeled as emotional or alcohol or drug problems). In addition, tribal members had access to a rich native healing tradition involving consultations with medicine people and participating in healing ceremonies designed to intervene in the spiritual world. Some traditional healing activities are quite lengthy and costs can be high (most are not covered by health insurance).[15] Although both tribes have active traditional systems of healing, each is organized differently. The Northern Plains' healing network is less formally organized and practices center on ceremonies that can be adapted to address multiple causes or symptoms of distress. The Southwest tribe has a more formally organized network of healers who perform specific diagnostic and healing ceremonies based on the particular source of distress. Traditional healing was assessed by asking respondents whether they had gone to a medicine man or traditional healer or had a ceremony for physical health problems or for mental health problems in the past year. We constructed four dichotomous dependent variables: 1) any use of biomedical services for physical health problems; 2) any use of traditional healers for physical health problems; 3) any use of biomedical services for mental health problems and 4) any use of traditional healers for mental health problems.

Independent Variables—Socio-demographic variables included tribe, gender, age, education, poverty status, employment, and marital status. Percent of life spent in the current community was determined by dividing each respondent's response to the question "How long have you personally lived in this community?" by the age of respondent. Health related quality of life in the past four weeks was measured by the physical health and mental health component summary scores from the SF36.[25] Indian identity was calculated using a 4-item scale representing connection to Indian values, traditions and practices. Items assessed how much respondents followed tribal traditions and practices, lived life the tribal way, importance of maintaining tribal identity, values, and practices, and the importance of family members maintaining tribal identity, values, and practices (0=none/not at all, 1=a little, 2=some/somewhat, 3=very/strongly). The items had good internal consistency (Chronbach's $\alpha = 0.72$) and responses were averaged to generate a composite score. Higher scores on this scale indicate a greater identification with Indian culture.[26–29]

Geographic barriers were measured using a Geographic Information System (GIS). The latitude and longitude of tribal members' home addresses were determined using a Global Positioning System (GPS). For about 5% of the sample, we used PO Box locations as a proxy. The locations of biomedical providers were geocoded using physical street addresses. It was not possible to geocode the locations of traditional healers because services are provided in diverse and changing locations across reservation communities, including the patients' homes, depending on need or ceremony. Road travel distance (miles) was calculated from each tribal member's residence to the closest biomedical service of any kind using the ArcView GIS system.[30] Both reservations have marked changed in elevation. The difference in elevation (feet) from the residence to the closest biomedical service location was also calculated based on the elevations at the latitude and longitudes of the two locations. This variable was included to capture the difficulty of traversing roads in terms of steepness and curvature. Qualitative interviews suggested that for those living on the reservation, crossing the reservation boundary to seek biomedical services outside the reservation was a psychological spatial barrier. Therefore, for those living on the reservation, we coded a dummy variable to be 1 if the closest biomedical service location was off the reservation, and 0 otherwise. In addition to these GIS-based geographic barriers, we asked how much of a problem bad local road conditions were (0 - not a problem, 1 – some problems, 2 – lot of problems).

Statistical Analysis

Because the two participating tribes have unique cultures and face different barriers to care, we analyzed the data separately for each tribe. To test the hypotheses, we used independent probit models, where utilization of biomedical services and traditional healers are modeled independently, or a seemingly unrelated bivariate probit model (SUBP), where the utilization of biomedical and traditional healing services are modeled jointly. The SUBP model specifically accounts for the possibility that the unmeasured factors (e.g., omitted variables, measurement error) affecting the utilization of biomedical services also affect the utilization of traditional healers, which leads to correlated error terms across the two probit regression equations. The SUBP model assumes this correlation follows a bivariate normal distribution (with covariance ρ) and calculates whether the error terms are significantly correlated and the direction of the correlation.[31, 32] If the correlation is not statistically significant, it implies that unmeasured factors influencing utilization of biomedical services and traditional healers are different. In this case, the most appropriate statistical analysis involves estimating the parameters of two independent probit regressions. On the other hand, if the correlation is significantly positive, it implies that unmeasured factors affect the utilization of biomedical services and traditional healers in the same way. Conversely, if the correlation is significantly negative, it suggests that the unmeasured factors affect the

utilization of biomedical services and traditional healers in opposite ways. In either case, a significant correlation suggests that the decisions to utilize biomedical and traditional healing services are interdependent and should be modeled jointly using the SUBP model to maximize statistical efficiency.

To test the substitution hypothesis (that the decision to use biomedical services directly affects the decision to use traditional healers), a second regression was specified that also included use of biomedical services as an explanatory variable in the probit equation predicting utilization of traditional healers. If the parameter estimate for biomedical service use (specified as a dummy variable) is negative and significant, it indicates that biomedical services are a substitute for traditional healing services, such that the greater use of biomedical services leads to lower use of traditional healers.[21] Conversely, if the parameter estimate is positive and significant, it indicates that biomedical services are a complement for traditional healing services, such that greater use of biomedical services leads to greater use of traditional healers. When use of biomedical services is included in the SUBP it is referred to as the bivariate probit with endogenous dummy model[31] or the recursive model for dichotomous choice (model 5).[33] Note that we chose to model the effect of biomedical services on traditional healers rather than vice versa because exogenous independent variables (e.g., travel barriers) for predicting utilization of biomedical services were available while exogenous independent variables for predicting utilization of traditional healers were not.

RESULTS

Descriptive statistics are presented in Table 1 separately for each tribe and for the sub-samples with chronic physical health problems and mental health disorders. For both the physical health and mental health samples, there were significant differences between the tribes with regards to poverty, mental health score, travel distance, elevation difference and the need to cross over the reservation boundary to get to the closest biomedical service. For the physical health sample, there were also significant differences between the tribes with respect to marital status and Indian identify.

Physical Health

Use of any services (biomedical or traditional healing) for physical health problems was somewhat lower in the Southwest Tribe (56.3%) than in the Northern Plains tribe (63.9%). While use of biomedical services for physical health problems was much lower in the Southwest tribe (41.2%) compared to the Northern Plains tribe (60.2%), use of traditional healing services was much higher in the Southwest tribe (29.4%) compared to the Northern Plains tribe (11.6%). For the Southwestern tribe, the use of biomedical and traditional healing services were positively correlated in bivariate analysis (χ^2=6.33 p=0.012) suggesting that the two sectors may be complementary. For the Northern Plains tribe, the use of biomedical and traditional healing services were positively, but not significantly correlated (χ^2=2.68 p=0.10).

For physical health, the parameter estimates of ρ in the seemingly unrelated bivariate probit (SUBP) models were not significant for either tribe (Southwest: ρ=0.09, p=0.19, Northern Plains: ρ=−0.02, p=0.80, results not reported). Therefore, the hypotheses were tested for physical health using independent probit models (see Table 2). For each tribe, the top panel of Table 2 presents the traditional healing regression results (with and without biomedical services included as an independent variable) and the bottom panel presents the biomedical service regression results.

Traditional Healing Services—For both tribes, the higher the physical health score (indicating better physical health quality of life), the less likely the study participant was to utilize traditional healing services for physical health problems. Likewise, for both tribes, those with a strong Indian identity were more likely to utilize traditional healers for physical health problems. Other covariates were not significant predictors. Contrary to our hypothesis, when the endogenous dummy variable representing utilization of biomedical services is introduced into the probit equation predicting utilization of traditional healers, it is non-significant. This indicates that for physical health, receiving biomedical services is not a substitute for traditional healers.

Biomedical Services—For both tribes, the higher the physical health score, the less likely the study participant was to utilize biomedical services for physical health problems. Likewise, for both tribes, those with some post high school education were more likely to utilize biomedical services. For the Southwest tribe, those living in poverty were less likely to utilize biomedical services. For the Northern Plains tribe, road travel distance and elevation change to the closest biomedical service location were significant negative predictors of utilizing biomedical services while the other travel barriers were not. For the Southwest tribe, none of the travel barriers were significant predictors.

Mental Health

Use of any services (biomedical or traditional healing) for mental health problems was relatively low in both tribes (27.8% for the Southwest tribe and 20.0% for the Northern Plains tribe). Use of biomedical services for mental health problems was similar among members of the Southwest tribe (13.7%) and the Northern Plains tribe (14.9%). However, use of traditional healing services was much higher in the Southwest tribe (19.0%) than the Northern Plains tribe (7.6%). For both tribes, the use of biomedical and traditional healing services were positively correlated in bivariate analysis (Southwest: χ^2=6.85 p=0.009; Northern Plains: χ^2=6.25 p=0.012), suggesting that the two sectors may be complementary.

The parameter estimate of ρ in the SUBP model was significant for the Southwest tribe (ρ=0.46, p<0.01), indicating that unmeasured factors affect the utilization of biomedical and traditional healing services for mental health in the same direction. However, the parameter estimate of ρ in the seemingly SUBP model was not significant for the Northern Plains tribe (ρ=0.26, p=0.11, results not reported). Therefore, the hypotheses were tested for mental health using a SUBP model for the Southwest tribe and an independent probit model for the Northern Plains Tribe (see Table 3).

Traditional Healing Services—For both tribes, the higher the mental health score (indicating better mental health), the lower the likelihood of utilizing traditional healers. Likewise, for both tribes, those with a strong Indian identity were more likely to utilize traditional healers for mental health problems. Contrary to our hypothesis, when the endogenous dummy variable representing utilization of biomedical services is introduced into the model, it is not a significant (p=0.07) predictor of utilizing traditional healers for the Northern Plains tribe. However, for the Southwest tribe, when the endogenous dummy variable representing utilization of biomedical services is introduced into the model, it is a significant (p<0.001) positive predictor of utilizing traditional healers. Contrary to our hypothesis, this finding indicates that, for members of the Southwest tribe, biomedical and traditional healing services are complements for treating mental health problems. Also, for members of the Southwest tribe, when the endogenous dummy variable representing utilization of biomedical services is introduced into the model, ρ changes signs and becomes non-significant. This reversal of signs is consistent with previous applications of the SUBP model and bivariate probit with endogenous dummy model,.[31, 32] and reflects that the

unmeasured determinants affecting the decision to utilize both biomedical services and traditional healing services are captured in the endogenous dummy variable.

Biomedical Services—For the Southwest tribe, none of the independent variables significantly predicted the use of biomedical services for mental health problems, including the travel barriers as hypothesized. For the Northern Plains tribe, the higher the mental health score, the lower the likelihood of utilizing biomedical services. Likewise, those living a higher proportion of their lives in their community were significantly less likely to use biomedical services for mental health problems. None of the travel barriers were significant predictors of using biomedical services for mental health problems as hypothesized. For the Northern Plains tribe, it was rare that an individual had to cross over the reservation boundary to get to the closest biomedical service and thus, this independent variable was dropped from the analysis.

DISCUSSION

Most tribal members with self-reported mental health problems did not seek any treatment, perhaps due to factors such as stigma or a lack of perceived need. The low rates of help seeking among American Indians with a mental health disorder suggest a large unmet need in these communities.

Use of traditional healers for both physical health and mental health problems was higher in the Southwest tribe compared to the Northern Plains tribe. This result is likely a consequence of the more formalized nature of traditional healing in the Southwest compared to the individualized nature of traditional healing in the Northern Plains, which may lead to a differential ability to measure use of traditional healers across these two reservations. Consistent with previously reported findings,[18, 34] the use of traditional healing services for both physical and mental health problems was strongly associated with stronger identification with Indian culture. Likewise, health related quality of life was a significant predictor of using traditional healers for both physical and mental health problems, suggesting that need was a driver of utilization.

Although the directions of the effects were consistently in the hypothesized direction, we found that use of biomedical services was largely unaffected by travel barriers. This finding is surprising given the rurality of the population, the difficult terrain, poor road conditions, and lack of personal transportation.[13, 14] Only members of the Northern Plains tribe with physical health problems were found to be adversely affected by travel barriers. Because elevation differences and travel distances were less in the Northern Plains tribe compared to the Southwestern tribe, we speculate that the lack of personal transportation and/or more severe weather conditions in the Northern Plains may have contributed to elevation and distance being more important barriers to care.

For physical health problems, having a high school education or greater was a significant predictor of receiving biomedical services as previously reported by Novins and colleagues.[18] This finding suggests that American Indians with greater exposure to mainstream American culture are more likely to use conventional biomedical services for their physical health problems. Again, health related quality of life was a significant predictor of biomedical service use for both physical and mental health problems.

For physical health the decisions to use biomedical and traditional healing services are made independently with no evidence of substituting one type of service for the other. This is consistent with findings reported by Gurley et al.[15] For mental health the findings depended on the tribe. For the Northern Plains tribe the decisions to use biomedical and traditional

healing were made independently, while for the Southwest tribe the use of biomedical services was positively correlated with using traditional health services. This may be due to the fact that use of traditional healers for mental health problems was much more common in the Southwest tribe compared to the Northern Plains tribe. In the Southwest tribe, the use of biomedical services had a direct positive effect (though not necessarily causal) on the use of traditional healers, indicating that these service sectors are complements, rather than substitutes as hypothesized. It is possible that members of the Southwest tribe see biomedical services and traditional healing as addressing different aspects of the same problem. For example, biomedical services may be thought to address psychiatric symptoms, while traditional healers may be thought to address the underlying cause of those symptoms such as breaching taboos, possession, or soul loss.[15, 35]

An alternative explanation is that these findings reflect sequential patterns of treatment seeking wherein those with treatment resistant mental health problems switch from one sector to the other.[15, 35] There are several methodological limitations. First, only two tribes were included in the sample and generalizations to other tribes are not necessarily possible. Second, the survey responses are over a decade old. Nevertheless, the AI-SUPERPFP represents the largest and most comprehensive epidemiological data ever collected about American Indians. Third, our measures of need for physical and mental health care and use of services were measured retrospectively and cross sectionally rather than longitudinally. retrospectively over the past year. Fourth, our analyses did not examine whether geographical access impacted the intensity or quality of care received, which has been observed in other rural populations.[6] The low utilization rates for either biomedical or traditional healing services, among those with an identified physical or mental health disorder, suggests that concerted efforts to improve the quality of biomedical services (and community perceptions of effectiveness) may be warranted in these two communities.

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Reference List

1. Wang PS, Lane M, Olfson M, Pincus HA, Wells KB, Kessler RC. Twelve-month use of mental health services in the United States: results from the National Comorbidity Survey Replication. Arch Gen Psychiatry. 2005; 62:629–640. [PubMed: 15939840]
2. U.S. Department of Health and Human Services. Healthy People 2010: Understanding and Improving Health. 2. Washington, DC: Government Printing Office; 2000.
3. Fortney JC, Harman JS, Xu S, Dong F. The association between rural residence and the use, type, and quality of depression care. J Rural Health. 2010; 26(3):205–213. [PubMed: 20633088]

4. Strauss K, MacLean C, Troy A, Littenberg B. Driving distance as a barrier to glycemic control in diabetes. J Gen Intern Med. 2006; 21(4):378–380. [PubMed: 16686817]
5. Arcury TA, Gesler WM, Preisser JS, Sherman J, Spencer J, Perin J. The effects of geography and spatial behavior on health care utilization among the residents of a rural region. Health Serv Res. 2005; 40(1):135–155. [PubMed: 15663706]
6. Fortney J, Rost K, Zhang M, Warren J. The impact of geographic accessibility on the intensity and quality of depression treatment. Med Care. 1999; 37(9):884–893. [PubMed: 10493467]
7. Cully JA, Jameson JP, Phillips LL, Kunik ME, Fortney JC. Use of psychotherapy by rural and urban Veterans. J Rural Health. 2010; 26(3):225–233. [PubMed: 20633090]
8. Hadley J, Cunningham P. Availability of safety net providers and access to care of uninsured persons. Health Serv Res. 2004; 39(5):1527–1546. [PubMed: 15333121]
9. Burgess JF Jr, DeFiore DA. The effect of distance to VA facilities on the choice and level of utilization of VA outpatient services. Soc Sci Med. 1994; 39(1):95–104. [PubMed: 8066492]
10. Johnson PJ, Carlson KF, Hearst MO. Healthcare disparities for American Indian veterans in the United States: A population-based study. Med Care. 2010; 48(6):563–569. [PubMed: 20473210]
11. Cunningham PJ, Cornelius LJ. Access to ambulatory care for American Indians and Alaska Natives; The relative importance of personal and community resources. Soc Sci Med. 1995; 40(3): 393–407. [PubMed: 7899951]
12. Zuckerman S, Haley J, Roubideaux Y, Lillie-Blanton M. Health service access, use, and insurance coverage among American Indians/Alaska Natives and Whites: What role does the Indian Health Service play? Am J Public Health. 2004; 94(1):53–59. [PubMed: 14713698]
13. Call KT, McAlpine DD, Johnson PJ, Beebe TJ, McRae JA, Song Y. Barriers to care among American Indians in public health care programs. Med Care. 2006; 44(6):595–600. [PubMed: 16708009]
14. Schmidt G. Barriers to recovery in a First Nations community. Can J Commun Ment Health. 2000; 19(2):75–87. [PubMed: 11381739]
15. Gurley D, Novins DK, Jones MC, Beals J, Shore JH, Manson SM. Comparative use of biomedical services and traditional healing options by American Indian veterans. Psychiatr Serv. 2001; 52(1): 68–74. [PubMed: 11141531]
16. Eisenberg DM, Kessler RC, Foster C, Norlock FE, Calkins DR, Delbanco TL. Unconventional medicine in the United States. N Engl J Med. 1993; 328:246–252. [PubMed: 8418405]
17. Ernst E. Prevalence of complementary/alternative medicine for children: A systematic review. Eur J Pediatr. 1999; 158:7–11. [PubMed: 9950300]
18. Novins DK, Beals J, Moore LA, Spicer P, Manson SM. Use of biomedical services and traditional healing options among American Indians: sociodemographic correlates, spirituality, and ethnic identity. Med Care. 2004; 42:670–679. [PubMed: 15213492]
19. Eisenberg DM, Davis RB, Ettner SL, et al. Trends in alternative medicine use in the United States, 1990–1997: Results of a follow-up national survey. J Am Med Assoc. 1998; 280(18):1569–1575.
20. Kessler RC, Soukup J, Davis RB, et al. The use of complementary and alternative therapies to treat anxiety and depression in the United States. Am J Psychiatry. 2001; 158:289–294. [PubMed: 11156813]
21. Bonadede M, Dick A, Noyes K, Klein JD, Brown T. The effect of acupuncture utilization on healthcare utilization. Med Care. 2008; 46(1):41–48. [PubMed: 18162854]
22. Beals J, Manson SM, Mitchell CM, Spicer P. Cultural specificity and comparison in psychiatric epidemiology: Walking the tightrope in American Indian research. Cult Med Psychiatry. 2003; 27(3):259–289. [PubMed: 14510095]
23. Manson, S.; Beals, J. [Accessed 7/8/2010] American Indian Services Utilization, Psychiatric Epidemiology, Risk and Protective Factors Project. 2008. Available at http://www.ucdenver.edu/academics/colleges/PublicHealth/research/centers/CAIANH/NCAIANMHR/ResearchProjects/Pages/AI-SUPERPFP.aspx
24. World Health Organization. Composite International Diagnostic Interview for Primary Care, Version 2.0. Geneva, Switzerland: World Health Organization; 1996.
25. Ware, JE.; Kosinski, M.; Keller, SD. SF-36 Physical and Mental Component Summary Measures: A User's Manual. Boston, MA: New England Medical Center; 1994.

26. Mitchell CM, Beals J. The structure of problem and positive behavior among American Indian adolescents: Gender and community differences. Am J Community Psychol. 1997; 25:237–288.
27. Moran J, Fleming CM, Somervell P, Manson SM. Measuring bicultural ethnic identity among American Indian adolescents: A factor analytic study. Journal of Adolescent Research. 1999; 14:405–426.
28. Novins D, Beals J, Roberts R, Manson S. Factors associated with suicide ideation among American Indian adolescents: Does culture matter? Suicide Life Threat Behav. 1999; 29:332–346. [PubMed: 10636327]
29. Novins DK, Mitchell CM. Factors associated with marijuana use among American Indian adolescents. Addiction. 1998; 93:1693–1702. [PubMed: 9926532]
30. Fortney J, Rost K, Warren J. Comparing alternative methods of measuring geographic access to health service. Health Services and Outcomes Research Methodology. 2000; 1(2):173–184.
31. Fabbri, D.; Monfardini, C.; Radice, R. Dipartimento di Scienze Economiche, Università di Bologna, Working Paper No 514. 2004. Testing exogeneity in the bivariate probit model: Monte Carlo evidence and an application to health economics. Ref Type: Generic
32. Costa-Font J, Gil J. Obesity and the incidence of chronic diseases in Spain: A seemingly unrelated probit approach. Economics & Human Biology. 2005; 3(2):188–214. [PubMed: 15941678]
33. Maddala, GS. Limited-dependent and qualitative variables in econometrics. Cambridge: Cambridge Univ. Press; 1983.
34. Buchwald D, Beals J, Manson SM. Use of traditional health practices among Native Americans in a primary care setting. Med Care. 2000; 38(12):1191–1199. [PubMed: 11186298]
35. Csordas, TJ.; Garrity, JF. Co-utilization of biomedicine and religious healing: A Navajo case study. In: Andritzky, W., editor. Yearbook of Cross-Cultural Medicine and Psychotherapy. Berlin: Verlag fur Wissenschaft und Bildung; 1994.

Table 1

Descriptive characteristics of Study Sample

	Physical Health Sample					Mental Health Sample				
	Southwest Tribe (n=702)[1]		Northern Plains Tribe (n=788)[1]			Southwest Tribe (n=248)[1]		Northern Plains Tribe (n=330)[1]		
	Mean %	Standard Deviation	Mean %	Standard Deviation	t-test/χ^2 p-value	Mean %	Standard Deviation	Mean %	Standard Deviation	t-test/χ^2 p-value
Age										
<45	64.53%		67.26%		0..23	76.61%		76.36%		0.92
≥45	35.47%		32.74%			23.39%		23.64%		
Gender										
male	37.32%		42.01%		0.08	55.24%		52.42%		0.47
female	62.68%		57.99%			44.76%		47.58%		
Martial status										
not married	36.04%		43.15%		0.01	47.98%		49.39%		0.76
married	63.96%		56.85%			52.02%		50.61%		
Post high school education										
none	65.38%		68.15%		0.25	71.77%		70.30%		0.69
at least some	34.62%		31.85%			28.23%		29.70%		
Poverty										
income >poverty level	55.41%		40.36%		<0.0001	49.60%		36.36%		<0.01
income < poverty level	44.59%		59.64%			50.40%		63.64%		
Indian identity scale	2.11	0.68	2.18	0.65	0.02	2.16	0.64	2.12	0.65	0.52
Proportion of life in current community	0.53	0.36	0.56	0.35	0.29	0.54	0.36	0.53	0.35	0.75
Mental Health Score	50.85	9.61	53.40	9.31	<0.0001	46.69	11.31	49.65	11.18	<0.01
Physical Health Score	47.38	9.73	47.14	11.12	0.67	47.75	9.96	48.02	10.27	0.73
Travel distance (miles)	22.36	22.59	10.81	14.06	<0.0001	18.84	17.96	11.42	14.85	<0.0001
Elevation diff feet	37.55	196.97	−12.10	65.36	<0.0001	37.44	163.91	−13.15	54.31	<0.0001
Live in reservation and had to cross boundary for biomedical services	11.97%		3.17%		<0.001	14.92%		3.64%		<0.0001

	Physical Health Sample					Mental Health Sample				
	Southwest Tribe (n=702)[1]		Northern Plains Tribe (n=788)[1]			Southwest Tribe (n=248)[1]		Northern Plains Tribe (n=330)[1]		
	Mean %	Standard Deviation	Mean %	Standard Deviation	t-test/χ^2 p-value	Mean %	Standard Deviation	Mean %	Standard Deviation	t-test/χ^2 p-value
Bad roads										
not a problem	68.48%		69.00%			68.02%		68.39%		
some problems	21.92%		20.33%		0.60	21.86%		21.58%		0.99
lots of problems	9.60%		10.67%			10.12%		10.03%		

[1]For the physical health subsample, 9 members of the Southwest Tribe and 5 members of the Northern Plains Tribe had missing values for service utilization. For the mental health subsample, 3 members of the Northern Plains Tribe had missing values for service utilization.

Table 2

Regression results, use of traditional and biomedical services for physical health problems

	Southwest Tribe				Northern Plains Tribe			
	Independent probit model		Independent probit model with biomedical variable		Independent probit model		Independent probit model with biomedical variable	
Used traditional services	**estimate**	**p-value**	**estimate**	**p-value**	**estimate**	**p-value**	**estimate**	**p-value**
Age ≥ 45	0.1260	0.289	0.1203	0.312	0.0801	0.562	0.0808	0.559
Female	0.1414	0.214	0.1343	0.239	0.1581	0.235	0.1589	0.233
Married	0.0523	0.652	0.0562	0.629	0.1136	0.390	0.1141	0.388
Some post high school education	−0.0886	0.464	−0.1183	0.337	0.2123	0.146	0.2140	0.145
Income < poverty level	0.0337	0.776	0.0441	0.711	−0.0256	0.856	−0.0265	0.851
Indian identity scale	0.9652	0.000	0.9605	0.000	0.8222	0.000	0.8231	0.000
Proportion of life in current community	−0.0903	0.557	−0.0737	0.633	−0.1677	0.358	−0.1672	0.360
Physical health score	−0.0218	0.000	−0.0209	0.000	−0.0207	0.000	−0.0208	0.000
Used biomedical services	n/a	n/a	0.1477	0.198	n/a	n/a	−0.0144	0.917
Used biomedical services	estimate	p-value			estimate	p-value		
Age ≥ 45	0.0571	0.594			0.1763	0.096		
Female	0.1750	0.088			0.1641	0.086		
Married	0.3474	0.735			0.1385	0.144		
Some post high school education	0.4666	0.000			0.3520	0.001		
Income < poverty level	−0.2506	0.019			−0.1520	0.138		
Proportion of life in current community	−0.2453	0.079			0.0537	0.687		
Physical health score	−0.0236	0.000			−0.2221	0.000		
Had to cross reservation boundary	0.0279	0.860			0.4121	0.142		
Travel distance	−0.0034	0.161			−0.0092	0.007		
Elevation difference	0.0002	0.549			−0.0018	0.029		
Bad roads	−0.0364	0.631			0.0575	0.412		

Table 3

Regression results, use of traditional and biomedical services for mental health problems

	Southwest Tribe				Northern Plains Tribe			
	Seemingly unrelated bivariate probit model[1]		Bivariate probit model with endogenous biomedical variable[2]		Independent Probit model		Independent probit model with biomedical variable	
Used traditional services	**estimate**	**p-value**	**estimate**	**p-value**	**estimate**	**p-value**	**estimate**	**p-value**
Age ≥ 45	0.2990	0.212	0.2894	0.178	−0.4539	0.116	−0.5001	0.087
Female	−0.0310	0.885	−0.0198	0.924	−0.0774	0.745	−0.0354	0.883
Married	0.1238	0.575	0.1850	0.382	−0.4546	0.061	−0.4560	0.062
Some post HS education	−0.0808	0.769	−0.0979	0.699	0.3930	0.121	0.4316	0.094
Income < poverty level	0.0503	0.836	−0.0236	0.922	−0.0651	0.801	−0.1374	0.603
Indian identity scale score	0.8139	0.001	0.7663	0.007	0.8791	0.000	0.8470	0.000
Proportion of life in current community	0.0121	0.969	−0.1072	0.723	−0.5397	0.107	−0.4529	0.184
Mental health score	−0.0202	0.023	−0.0163	0.092	−0.0205	0.033	−0.0184	0.059
Used biomedical services	n/a	n/a	2.1164	0.001	n/a	n/a	0.5178	0.071
Used biomedical services	estimate	p-value	estimate	p-value	estimate	p-value		
Age ≥ 45	−0.0487	0.865	−0.1528	0.641	0.3095	0.125		
Female	−0.0349	0.901	−0.1304	0.674	−0.1079	0.565		
Married	−0.1907	0.408	−0.1426	0.544	0.0063	0.972		
Some post HS education	0.0800	0.760	0.0216	0.940	−0.1014	0.633		
Income < poverty level	0.2346	0.332	0.2403	0.361	0.3187	0.135		
Proportion of life in current community	0.3091	0.415	0.2990	0.481	−0.5048	0.050		
Mental health score	−0.0074	0.501	−0.0066	0.550	−0.0207	0.006		
Had to cross reservation boundary	−0.5453	0.267	−0.3251	0.360	n/a[3]	n/a[3]		
Travel distance	0.0024	0.758	0.0045	0.465	−0.0106	0.127		
Elevation difference	−0.0014	0.133	−0.0014	0.144	0.0008	0.707		
Bad roads	−0.1450	0.474	−0.1858	0.423	0.0121	0.926		
Rho	0.4580	0.003	−0.7592	0.542	n/a	n/a		

[1] Because the error terms are modeled jointly in the SUBP, this statistical technique accounts for the correlation in the unmeasured factors affecting both types of utilization. Regression parameters were estimated using the biprobit commands in Stata version 9. The significance of the correlation coefficient ρ is tested using a likelihood ratio test that compares the loglikelihood of the model where ρ is restricted to 0 to the loglikelihood of the model where ρ is unrestricted.

[2]Regression parameters were estimated using the biprobit commands in Stata version 9. For this model to be fully identified, the probit equation predicting utilization of biomedical services must contain exogenous independent variables that are appropriately not included as independent variables in the probit equation predicting utilization of traditional healers.[21] The inclusion of travel barrier variables in the probit equation predicting utilization of biomedical services ensures that the bivariate probit with endogenous dummy model is fully identified.

[3]Model would not converge with this variable included.