Ethnomedical and Biomedical Realities: Is There an Epidemiological Relationship Between Stress-Related Folk Illnesses and Type 2 Diabetes?

Roberta D. Baer, Susan C. Weller, Javier Garcia de Alba Garcia, and Ana L. Salcedo Rocha

Applied medical anthropologists often find themselves working as culture brokers between community and/or patient groups and biomedical providers/public health institutions, where conflicting ethnomedical and biomedical realities can cause tension. In this paper, we examine ethnomedical perceptions of the role of folk illnesses in the etiology of diabetes. We operationalize the biomedical perspective as epidemiological patterns and explore whether ethnomedical perceptions about diabetes etiology can be demonstrated epidemiologically. The motivation for the study was the realization that if an ethnomedical diagnosis of a folk illness such as susto (fright) and/or nervios (nerves) increased the risk for diabetes, there might be important implications for biomedical screening for this disease. Anthropological studies suggesting that folk illnesses and diabetes may be associated have not actually tested for an association; their conclusions rely solely on patients’ reports of a causal link. Here, we use a case-control design, similar to Rubel, O’Nell, and Collado-Ardon’s (1984) study on susto, to test for an association between having had a folk illness and developing diabetes. This methodological approach, with a comparative study design, may prove useful to other applied medical anthropologists concerned with understanding relationships between ethnomedical and biomedical realities.

Key words: susto, diabetes, nervios, folk illnesses

Introduction

In this paper, we address a core theoretical and applied issue in medical anthropology, the relationship between ethnomedical and biomedical realities. Applied medical anthropologists often find themselves working as culture brokers between community and/or patient groups and biomedical providers/public health institutions, where conflicting realities can cause tension. In this paper, we examine ethnomedical perceptions of the etiology of diabetes and explore whether the ethnomedical belief that folk illnesses increase the risk for diabetes can be demonstrated epidemiologically.

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Emotional experiences and folk illnesses such as susto (fright) and nervios (nerves) are often mentioned in narratives of diabetes etiology by Mexican and Mexican-American diabetic patients. Patients often report that these folk illnesses caused their diabetes. Susto and nervios are widely recognized illnesses among Latin Americans (Baer et al. 2003; Weller et al. 2002) and are cultural constructions that express stress and depression (Guarnaccia, Lewis-Fernandez, and Marano 2003; Weller et al. 2008). Although strong emotions and stress have not been clearly or directly linked to the development of diabetes, stress has been implicated in the etiology of other chronic diseases. This study examines whether an epidemiological association exists between the occurrence of stress-related folk illnesses and diabetes. Our key question is: Are people who have experienced susto or nervios at higher risk of diabetes? To what extent do ethnomedical beliefs overlap with what is seen through an epidemiological lens?

One point of tension between the different realities is the nature of evidence; within the biomedical realm it is necessary to adhere to scientific rules of evidence. Such evidence comes from systematic studies, such as randomized controlled experiments or clinical trials, longitudinal or cohort studies, and case-control or cross-sectional studies. Here, we assess the ethnomedical belief that “folk illnesses
can cause diabetes” using a case-control comparative design. The motivation for the study was the realization that if an ethnomedical self-diagnosis of a folk illness increased the risk for diabetes, there might be important implications for biomedical screening for this disease.

**Background**

Relationships between ethnomedical concepts and those of biomedicine are a key concern of applied medical anthropologists. There are a number of approaches to determining how these perspectives relate, if at all. Some, such as Kleinman et al. (1978), have stressed the necessity of understanding both the patient and provider models and then finding a bridge between them. Others have shown that ethnomedical practices can be biomedically appropriate, such as the demonstration that traditional diarrhea remedies may be as effective as Oral Rehydration Salts (ORS) solutions (Acra, Raffoul, and Karahagopian 1984; Sukkary-Stolba 1990). Applied medical anthropologists have also tried to understand ethnomedical concepts and experiences in biomedical terms. For example, Rubel, O’Nell, and Collado-Ardon (1984) explored morbidity and mortality associated with the folk illness susto. Other anthropologists have investigated whether folk treatments are biomedically appropriate (Baer and Bustillo 1993, 1998) and if folk illnesses correspond to biomedical diseases. For example, the Mexican folk illness, empacho (indigestion), appears to overlap significantly with what biomedicine terms gastroenteritis (Baer et al. 1989; Weller et al. 1993).

The ethnomedical systems of Mexicans and Mexican Americans have been of longstanding applied medical anthropological interest. But, to work effectively with these populations in applied settings, we need to explore how ethnomedical beliefs and practices mesh with those of biomedicine. The ethnomedical data on the belief in a relationship between the folk illness, susto, and diabetes onset are extensive. Here, we explore whether this association can be demonstrated as an epidemiological pattern. Our findings contribute to medical anthropological theory, as well as suggest methodological approaches relevant in the area of explorations of ethnomedical-biomedical relationships in applied medical anthropology.

Descriptions of susto and nervios come primarily from anthropology. Susto and nervios are stable ethnomedical illness concepts similar to other illnesses, such as the common cold, except that they reflect psychological distress and are not recognized by biomedicine. Previous studies of susto (Weller et al. 2002) and nervios (Baer et al. 2003) in Guadalajara, Mexico, indicate that these illnesses are highly prevalent and that community members share an explanatory model (beliefs about causes, symptoms, and treatments) for these illnesses much as they do for other illnesses such as the common cold, diabetes, and asthma. Both susto and nervios are cultural expressions for distress and are correlated with standardized measures of stress and depression (Weller et al. 2008).

Nervios describes a range of mental health problems (Guarnaccia, Lewis-Fernandez, and Marano 2003). Ethnomedically defined symptoms include crying, difficulty sleeping, trembling, sadness, and depression; treatment includes relaxation, sedatives, and prayer (Baer et al. 2003). Mexicans commonly report that untreated nervios can cause diabetes (Baer et al. 2003).

The classic Mexican description of susto comes from the work of Rubel, O’Nell, and Collado-Ardon (1984). Susto is caused by a frightening experience: a sudden surprise or shock, such as seeing someone get killed or being in an accident. Symptoms include agitation, difficulty sleeping, paleness, fear of unfamiliar places and people, and a general malaise; treatments include relaxation and psychological therapy (Weller et al. 2002). Rubel, O’Nell, and Collado-Ardon’s work (1984) also pioneered the use of a case-control design to study susto, investigating relationships of social stress, and psychological and physiological problems among individuals with susto and those without it. Susto was found to be associated with greater morbidity (greater stress and a greater likelihood of parasitic infections and anemia), as well as a significantly higher mortality rate.

Numerous anthropological studies among Mexicans and Mexican-Americans report on a perceived relationship between susto and onset of type 2 diabetes. Mexican and Mexican-American patients with diabetes tend to include descriptions of susto among the causes of their disease (Da-nulaityte 2004; García de Alba García et al. 2007; Mendenhall et al. 2010; Mendenhall et al. 2012; Mercado-Martinez and Ramos-Herrera 2002; Poss and Jezewski 2002; Scheder 1988). Additionally, in community-based studies in Mexico, respondents reported that diabetes can be caused by susto, strong emotions, or anger, and that the failure to treat susto could lead to diabetes (Weller et al. 1999; Weller et al. 2002). Similarly, immigrant Latinos in rural North Carolina linked susto with the onset of diabetes (Arcury et al. 2004).

The literature also links diabetes to stress and trauma. Diabetic patients report stress as a cause of diabetes (Broom and Whittaker 2004; Cohen et al. 1994) as well as emotional trauma and anger (Loewe and Freeman 2000). A sample of largely Puerto Rican female patients “ascribed the etiology of their type 2 diabetes to an immensely stressful event that took place within one year of diagnosis with the disease” (Adams 2003:257). Schoenberg (2005) found that among African-American, Mexican-American, Great Lakes Indian, and rural White diabetic patients, stress was considered to cause or precipitate the onset of diabetes. Patients reported stressors that were due to a particular event (similar to susto), as well as some stressors that were more protracted (similar to nervios).

While the anthropological studies of Mexicans and Mexican Americans suggest that a folk diagnosis of susto or nervios might indicate increased risk for diabetes, none of the studies used a methodology appropriate to assess whether such an epidemiological association exists. The linking of these specific folk illnesses to diabetes would be consistent
with biomedical evidence suggesting a possible link between stress and diabetes. For example, people with undiagnosed diabetes report more stressful life events than people with normal blood sugar levels (Mooy et al. 2000), and women with low decision latitude at work and inadequate coping resources have a higher risk of diabetes (Agardh et al. 2003). Chronic work stress also can be associated with weight gain, which in turn can increase risk for type 2 diabetes (Chandola, Brunner, and Marmot 2006).

Our study begins with the critical next step: to identify whether there is evidence of an epidemiological association between folk illnesses and diabetes. While demonstration of an association does not necessarily ensure that a causal relationship exists, such a finding is the first step in exploring such a relationship. To assess the presence or absence of an association, such as the suggested hypothesis that having susto or nervios increases the risk of having diabetes, a comparison or contrast group must be included. For example, the occurrence of folk illnesses in those with diabetes can be compared with the occurrence of folk illnesses in those without diabetes. Single group designs (diabetic patients and no comparison group) cannot provide information about whether or not an association is present, although they can be valuable for hypothesis generation.

This paper considers options for research design and the use of different comparison groups to test for such an association. First, we looked at the prevalence of stress-related folk illnesses in a sample of diabetic patients, similar to the descriptive studies reporting ideas about folk illness and diabetes causation. Second, we added a comparison group of nondiabetic patients and showed the limitations in relying upon a single group design. Third, because the diagnosis and management of diabetes might influence the occurrence of these stress-related folk illnesses, we examined the association between having had a folk illness and having undiagnosed diabetes (high blood sugar levels) in a sample of people without a prior diagnosis of diabetes. Thus, through a series of epidemiological case-control study designs, we conducted a detailed examination of the possibility of an association between folk illnesses (susto and nervios) and diabetes.

**Methods**

**Setting**

Guadalajara was chosen as the site for this study because studies on community beliefs about susto (Weller et al. 2002) and nervios (Baer et al. 2003) indicate that experience with these folk illnesses is common in this part of Mexico. Guadalajara is the second largest city in Mexico with a population of approximately four million people of mixed European and indigenous ancestry. The prevalence of diabetes in Mexico is increasing rapidly, comparable to rates in the United States (Aguilar-Salinas et al. 2003; Cowie et al. 2003).

Interviews were conducted in a family practice clinic of the Instituto Mexicano de Seguro Social (IMSS). The clinic offers outpatient treatment and emergency care by family practice physicians to 110,000 largely working class patients. The study protocol was approved by the Research and Ethical Board of the IMSS and the human subjects review boards of the universities involved.

**Procedure**

Participants in the study were selected from those who presented for appointments with their family practice physician. Patients in whom diabetes was diagnosed at 30 years or older by a physician, and who had this diagnosis for at least one year, were invited to participate. Patients with gestational diabetes or type 1 diabetes were excluded. A second sample was drawn from the same clinic population: patients 30 years and older in whom diabetes had not been diagnosed.

All participants were interviewed in the clinic about their experience with susto and nervios and their opinions regarding causes of diabetes. They were asked, “¿Usted cree que una causa de la diabetes es el susto?” (Do you believe that one cause of diabetes is susto?); response categories were yes, no, and possibly. They were also asked, “¿Ha padecido susto?” (Have you suffered from susto?); response categories were yes and no. All questions were repeated for nervios. Additionally, diabetic patients were asked, “¿El susto ha causado su diabetes?” (Did susto cause your diabetes?); response categories were yes, no, and possibly. Since definitions of susto and nervios are highly shared in Guadalajara (Baer et al. 2003; Weller et al. 2002), these self-reported experiences with these illnesses were accepted as accurate (within the limits of memory accuracy). Blood glucose levels were measured on all participants.

**Analysis**

Comparisons between diabetic and nondiabetic patients were made with a chi-square test for categorical variables (presence of folk illnesses and other categorical variables) and a t-test for continuous variables (age). Multivariate analyses controlled for differences in demographic characteristics (age, gender, rural background, and educational level) between the samples in tests for an association between folk illnesses and the presence or absence of a diagnosis of diabetes (or hyperglycemia). The association between diabetes and each folk illness is expressed as an odds ratio (OR) and as an adjusted odds ratio in multivariate analyses. All statistical analyses were run in SAS (SAS 2001).

**Results**

**Beliefs About the Causal Role of Folk Illness and Prevalence of Folk Illness Among Diabetic Patients**

We recruited a large sample: 836 patients were asked to participate, 811 were interviewed, and 796 interviews were completed. The average age of diabetic patients was 60 years,
ranging from 33 to 94 years. The majority of participants were women, married, and from an urban background. The mean age of diagnosis for diabetes in the sample was 50 years, and the mean duration of diabetes was 10 years. The sample’s educational level was somewhat higher than the national average (6 years) (INEGI 2004), possibly due to the fact that IMSS patients come largely from working class backgrounds. In the national population, about 40 percent are poor and tend not to be employed in work situations that make them eligible for health care by IMSS; their educational levels also tend to be lower than the national average.

Personal experience with these folk illnesses was very common. More than two-thirds (68%) of diabetic patients reported having experienced susto at some time in the past, and 58 percent reported having had nervios. Patients with a longer duration of diabetes, however, were more likely to report experience with susto and nervios. Among individuals with a recent diagnosis of diabetes (less than five years), 63 percent reported experience with susto compared with 71 percent among those who had diabetes for five years or more ($p=0.03$). Similarly for nervios, 52 percent of individuals who had diabetes for less than five years reported experience with nervios, compared with 60 percent among those who had diabetes for five years or more ($p=0.07$).

Because those who had diabetes for a longer period of time may have experienced a folk illness after the onset of diabetes, we limited the sample to those who were recently diagnosed (less than five years, n=239) (Table 1). Thus, we increased the likelihood that the folk illness was experienced at or before the diagnosis of diabetes. The estimated prevalence of susto decreased from 68 percent for the full sample (n=796), to 63 percent for the modified sample (n=239), and the prevalence for nervios decreased from 58 percent (n=796) to 52 percent (n=239).

The responses to the question of whether emotional experiences can cause diabetes tended to confirm what previous studies have suggested: many believe that such experiences are implicated in diabetes etiology. Fifty-one percent said susto caused diabetes, 20 percent said it might, and 29 percent said it did not cause diabetes. When asked if susto caused your diabetes, however, the pattern of responses reversed: 29 percent said yes, 13 percent said it might have, and 58 percent said no. Few reported that nervios caused diabetes: 35 percent said that it did, 14 percent said it might, and 51 percent said that it did not cause diabetes.

### Table 1. Sample Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Diabetic Patients (&lt; 5 Years Since Diagnosis) (n=239)</th>
<th>Non-Diabetic Patients (n=200)</th>
<th>Total (n=439)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age*</td>
<td>55.7</td>
<td>52.7</td>
<td>54.3</td>
</tr>
<tr>
<td>Married</td>
<td>71%</td>
<td>68%</td>
<td>69%</td>
</tr>
<tr>
<td>Women*</td>
<td>54%</td>
<td>67%</td>
<td>60%</td>
</tr>
<tr>
<td>Educational level*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>12%</td>
<td>23%</td>
<td>17%</td>
</tr>
<tr>
<td>Incomplete primary</td>
<td>22%</td>
<td>11%</td>
<td>17%</td>
</tr>
<tr>
<td>Primary</td>
<td>34%</td>
<td>30%</td>
<td>32%</td>
</tr>
<tr>
<td>&gt; Primary</td>
<td>32%</td>
<td>36%</td>
<td>34%</td>
</tr>
<tr>
<td>Monthly income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$0-$1,999</td>
<td>27%</td>
<td>18%</td>
<td>23%</td>
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<tr>
<td>$2,000-$3,999</td>
<td>37%</td>
<td>41%</td>
<td>39%</td>
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<tr>
<td>$4,000-$5,999</td>
<td>21%</td>
<td>21%</td>
<td>21%</td>
</tr>
<tr>
<td>&gt; $6,000</td>
<td>15%</td>
<td>20%</td>
<td>17%</td>
</tr>
<tr>
<td>Urban background*</td>
<td>70%</td>
<td>82%</td>
<td>75%</td>
</tr>
</tbody>
</table>

* Difference between samples $p<0.05$
Those without diabetes were selected from the same population as the diabetic patients; they were patients at the same IMSS clinic with similar sociodemographic characteristics, but who did not have a prior diagnosis of diabetes. The non-diabetic patients appeared at the clinic for general health problems including colds, colitis, gastritis, and bronchitis. Of the 209 approached for participation, there were nine refusals due to lack of time or the need to get to work. The mean age of those without diabetes was 54 years, approximately two-thirds (69%) were married, and the majority (60%) were women (Table 1). The two samples did not differ in terms of their marital status or income, but the nondiabetic patients tended to be younger (p<.05), female (p<.05), from an urban background (p<.05), and slightly less educated (p<.05).

With respect to the relationship of folk illnesses as a cause of diabetes, more patients without diabetes (65%) than patients with diabetes (51%) reported that susto could cause diabetes (p<.01). In contrast, the majority of both samples (51% and 52%) reported that nervios did not cause diabetes (p=.97).

A comparison between the proportion of patients who had experienced a folk illness between those with and without diabetes was made with a chi-square test, and the association was estimated with the odds ratio. Although the proportion of diabetic patients reporting experience with susto was high (63%), the proportion of patients without diabetes who reported experience with susto was actually a little higher (69%). Thus, the two samples had similar proportions of people reporting having had susto at some time in the past (p=.17), but those with diabetes were .75 times less likely than those without diabetes to have had susto (OR=0.75, 95% CI: 0.50, 1.11).

Because older age, lower educational level, female gender, and rural background might increase the likelihood of susto and nervios, and because these variables are also sometimes associated with an increased risk for diabetes, a logistic regression was used to statistically control for these differences between the samples. After controlling for these factors, we found the association slightly reduced, moving toward the null value of 1.0 to an adjusted odds ratio of .83 (adjusted OR=0.83, 95% CI: 0.53, 1.30). Results were essentially unchanged and continued to indicate a slightly lower (but not statistically significant) risk of diabetes for those who had reported experience with susto.

The two samples differed significantly in terms of the proportion of patients who had experienced nervios, but the pattern was similar to that for susto and directly opposite of the prediction of the stress hypothesis. Those with diabetes were .59 times less likely (OR=0.59, 95% CI: 0.40, 0.89) than those without diabetes to have had nervios: 52 percent of the diabetic patients and 65 percent of those without diabetes reported experience with nervios (p<.01). When age, educational level, gender, and background differences were controlled, the association between nervios and diabetes was no longer statistically significant. The bivariate odds ratio of .59 moved toward the null value of 1.0, and the adjusted odds ratio indicated a .70 lower risk of diabetes for those with experience with nervios (OR=0.70, 95% CI: 0.45, 1.10), although the effect was not statistically significant.

Thus, a comparison of patients with diabetes (within five years of diagnosis) and patients without diabetes (from the same clinic) showed that although the majority of diabetic patients reported experience with susto and nervios, the majority of patients without diabetes also reported experience with these folk illnesses. There was neither an association nor a tendency for those with experience with these folk illnesses to be more likely to have diabetes. To the contrary, both those who reported experience with susto and those who reported experience with nervios were actually less likely to have diabetes. Controlling for important variables such as age, gender, and background did not change these relationships.

Prevalence of Folk Illnesses in Those With Undiagnosed Diabetes and Those With Normal Blood Sugar Levels

One issue in examining the possible relationship between a folk illness and diabetes is the difficulty in establishing the temporal relationship of the two conditions (whether the folk illness preceded the diagnosis of diabetes). If a folk illness occurred at or after the diagnosis of diabetes, the rates of folk illnesses would be overestimated among the diabetic patients because the rates of folk illnesses seem to increase with the duration of the disease. To minimize this type of bias, we focused on the sample of 200 patients without a prior diagnosis of diabetes. Our goal was to create two groups from within that sample: a group of patients with undiagnosed diabetes (elevated blood sugar) and a group with normal blood glucose, and to compare the prevalence of folk illnesses between the two groups. In this analysis, we focused only on those without a prior diagnosis of diabetes to ensure that reported folk illnesses would precede the diagnosis of diabetes and avoid the stress (and folk illnesses) that might have resulted from the diagnosis and management of diabetes.

The American Diabetes Association defines diabetes as fasting plasma glucose (FPG) greater than 126 mg/dL (FPG≥126 mg/dL) (ADA 2008). We hypothesized that if susto and nervios were associated with diabetes, folk illnesses should be more frequent among those with undiagnosed diabetes (FPG≥126 mg/dL) than among those without diabetes (FPG<126 mg/dL). Or alternatively, those who have had a folk illness should have higher blood sugar levels.

An FPG was obtained on 155 of the 200 patients without a prior diagnosis of diabetes. The average FPG was 105.7 mg/dL, and 7.1 percent (n=11) had values of 126 mg/dL or greater, indicating undiagnosed diabetes. Patients with undiagnosed diabetes, however, were 0.48 times less likely to report experience with susto: 55 percent of those with undiagnosed diabetes and 72 percent of those without diabetes reported experience with susto (OR=0.48, 95% CI: 0.14, 1.65; p=.23). In a logistic regression controlling for age, gender, and rural/urban background, the results were essentially the same, indicating that for those without a prior diagnosis of
diabetes, respondents who reported experience with susto had a .35 lower risk for diabetes than did respondents not reporting experience with susto (adjusted OR= 0.35, 95% CI: 0.09, 1.43; p=.14).

The same pattern was true for nervios. We found no increase in diabetes risk for those reporting experience with nervios: risk was .93 less (OR=0.93, 95% CI: 0.26, 3.33; p=.91); 64 percent of those with undiagnosed diabetes and 65 percent of those with normal blood glucose reported experience with nervios. In a logistic regression controlling for age, gender, and background, those reporting experience with nervios were 0.97 times less likely to have diabetes (adjusted OR=0.97, 95% CI: 0.23, 4.03; p=.96). In summary, patients with undiagnosed diabetes were not more likely to have had susto or nervios than were patients with normal blood sugar levels.

Furthermore, a comparison of blood sugar levels between those who did and did not report experience with a folk illness indicated that mean blood sugar levels were not higher among those who had had a folk illness. Those reporting experience with susto averaged 105.3 mg/dL and those without susto averaged 106.8 mg/dL (p=.81). Patients who had had nervios averaged 104.4 mg/dL, and those not reporting experience with nervios averaged 108.2 mg/dL (p=.54). Multiple regression was used to control for age, gender, and rural/urban background in assessing the association between susto and nervios on FPG (in separate analyses). Results were unchanged, showing that susto (standardized slope= -0.02; p=.82) and nervios (standardized slope= -0.03, p=.69) did not have a significant or positive association with FPG.

**Discussion and Conclusions**

Given the ethnomedical reports of folk illnesses and stressful experiences by diabetic patients (Danilaityte 2004; Garcia de Alba Garcia et al. 2007; Mendenhall et al. 2010; Mendenhall et al. 2012; Mercado-Martinez and Ramos-Herrera 2002; Poss and Jezewski 2002; Scheder 1988) and the association between folk illnesses and stress, we anticipated that a systematic, epidemiological comparison of recently diagnosed diabetic patients with a control group would show evidence of an association between folk illnesses and diabetes. In contrast, we found that the prevalence of susto among those with a recent diagnosis of diabetes (63%) was not higher than that among controls without a diagnosis of diabetes (69%). Furthermore, the prevalence of susto among those with undiagnosed diabetes (55%) was not higher than that among those without undiagnosed diabetes (72%). If susto were a risk factor for diabetes, we should have seen a higher prevalence of susto among those with undiagnosed diabetes or among those with a recent diagnosis of diabetes. Similarly, for nervios, we did not find a higher prevalence among those with recently diagnosed diabetes (52%) than among those without a diagnosis of diabetes (65%). Neither did we find a difference between those with undiagnosed diabetes (64%) and those with normal glucose (65%).

A critical first step in determining whether stress or folk illnesses might contribute to the etiology of diabetes is to demonstrate that an association is present (Hill 1965; Susser 1991). Our finding of no association points to the limitation in generalizing from “single group studies.” When studies lack a proper comparison group, whether or not a factor increases risk cannot be determined. Reports based on only a sample of diabetic patients simply cannot determine whether folk illnesses and stressful events occur with higher or lower frequency among diabetic patients.

The association also should be evident after controlling for extraneous variables (Hill 1965; Susser 1991). The two clinic samples differed slightly on age, education, rural background, and gender. While older age and rural background would be expected to increase belief in, and thus, rates of folk illnesses, having fewer women could decrease the rate of reporting experience with folk illnesses. We used a multivariate analysis to statistically control or equalize these variables in the two samples. After adjustment, the results were essentially the same as those for the unadjusted analyses, indicating that experience with folk illnesses did not increase the risk of diabetes.

Finally, the risk factor (folk illness) should precede the outcome (diabetes) (Hill 1965; Susser 1991). One limitation in comparing diabetic patients with controls was the reliance on self-reports of past folk illnesses, making it impossible to determine whether the folk illness actually preceded the diagnosis of diabetes. To minimize this bias, we focused on recently diagnosed diabetic patients and compared them with a sample of nondiabetic patients. Then, we focused on patients without a prior diagnosis of diabetes and compared undiagnosed diabetic patients with nondiabetic patients. This latter test ensured that the folk illness preceded a diagnosis of diabetes and allowed for a stronger test of the relationship between folk illnesses and disease onset. However, this stronger design still failed to show a positive association.

An additional concern might be that our finding of no evidence for an association resulted from small sample sizes. This could be an issue, especially when comparing the 11 patients with undiagnosed diabetes with the 144 patients with normal blood sugar. Statistical power for detecting a difference between the two groups could be an issue if, and only if, the direction of the difference indicated that the diabetic sample had a slightly higher rate of folk illness than the comparison group. Results, however, indicated that the diabetic subgroup was less likely to report experience with a folk illness. Thus, a much larger sample size could add statistical power and detect a statistically significant association, but would indicate that those with a folk illness were at lower risk for diabetes.

A final concern is the possible bias due to stress occurring in both the diabetic and non-diabetic samples. Could the association between folk illness and diabetes be masked by high levels of stress among the ill patients serving as a comparison group? Since clinic patients tend to have more depressive symptoms than do community samples (Wittchen,
Ustun, and Kessler 1999), could the control group have higher levels of stress and folk illnesses than would a community sample of controls? The direction of possible bias here is unclear as, conversely, the rate of folk illnesses among the non-diabetic controls could be lower than community estimates, because those who use biomedical clinics may be less likely to experience and report such illnesses. To test either idea, we would need community data on the prevalence of these folk illnesses.

Community estimates for the prevalence of these folk illnesses in Guadalajara, Mexico, are available in the literature. In Weller et al.’s (2002) study of beliefs about susto, community interviews asked whether respondents had had susto. In that study, the estimated prevalence of susto was 50 percent (23/46 households reported susto). In a similar study on beliefs about nervios, Baer et al. (2003) asked community members if they had had nervios. In that study, 60 percent reported nervios (24/40).

These estimates, although based upon small sample sizes, can be cautiously compared to the sample of diabetic patients. For susto, the community sample estimate of 50 percent indicates that the community population prevalence is between 36 percent and 64 percent (with 95% confidence limits). This interval captures the 63 percent rate observed in our sample of recently diagnosed diabetic patients. Thus, while the rates of susto in the diabetic samples are elevated, they are not significantly higher than in the community. Similarly, the community sample estimate of 60 percent for nervios indicates that the community population prevalence is between 45 percent and 75 percent (with 95% confidence limits). This confidence interval contains the 52 percent estimate for diabetic patients. This indicates that the prevalence of nervios in the diabetic sample may not be significantly different from that in the community. We conclude, therefore, that the observed levels of susto and nervios in diabetic patients, although they seem to be high, are not significantly higher than those found in the surrounding community.

The question remains, then, how it is possible that reports of diabetic patients consistently contain descriptions of emotional and stressful events in their explanations of how they developed diabetes (Daniulaityte 2004; Garcia de Alba Garcia et al. 2007; Mendenhall et al. 2010; Mendenhall et al. 2012; Mercado-Martinez and Ramos-Herrera 2002; Poss and Jezewski 2002; Scheder 1988)? Is it reasonable to assume that these events somehow influenced the onset of the disease? One issue is the limitation with retrospective reporting of events and faulty logic: because A precedes B, it does not necessarily mean that A caused B. People may try to make sense of how they came to develop diabetes and try to link its occurrence to some unfortunate event in their lives. If narratives of individuals with diabetes were compared to those of individuals with other chronic diseases, similar explanations might be reported. What may be occurring, then, is not necessarily that folk illnesses are associated with diabetes, but that people are trying to make sense out of their experience and have identified a proximal experience as a possible cause.

As such, the link between folk illnesses and diabetes may be real for the people who so believe; however, we found no evidence for an epidemiological association.

This study, then, makes a number of contributions. The first is the substantive finding of a lack of evidence for epidemiological association between experience with susto and risk of diabetes. At a theoretical level, our findings reaffirm the distinctions between ethnomedical and biomedical realities posited by Kleinman et al. (1978) over 30 years ago.

A second contribution of our work is a methodological model for exploring relationships between ethnomedical and the biomedical realities. Qualitative, ethnomedical data are critical for the generation of hypotheses. However, we cannot test these hypotheses without use of data on actual experience with the risk factor, as well as with the use of comparison groups at all stages of the study and analysis. Judgments about whether a rate is high or low and determination of associations cannot be made without reference to a comparison group. This study used two different case-control comparisons, each with advantages and disadvantages, to assess the hypothesis suggested by the qualitative data of an epidemiological association between susto, nervios, and diabetes. Using two separate tests, we found that for the samples we examined, we found no evidence for an epidemiological association between these folk illnesses and diabetes.

Finally, our study contributes to applied anthropological work with Mexican and Mexican American patients and their physicians. The belief that susto is a cause of diabetes is important; we see in this case, the ethnomedical perception that experience with a folk illness causes a biomedically recognized disease. Much of the other work done on connections between ethnomedical and biomedical paradigms within the Mexican/Mexican-American tradition deals with understanding the common folk illnesses, caida de la mollera (fallen fontanelle), susto, empacho, and nervios. Recommendations to physicians in those cases are to focus on the symptoms with which the patient presents, as opposed to patient alternative (to biomedicine) concepts about etiology (Baer and Bustillo 1993, 1998). In the case of susto and diabetes, medical anthropologists should make similar recommendations to physicians—refrain from arguing alternative concepts of etiology with patients and their families, and focus instead on the path forward, the treatment of symptoms, and means of avoiding increased disease related morbidity and mortality.

In conclusion, susto as a cause of diabetes may be ethnomedically important, but we found no evidence for this association using a systematic, comparative, epidemiological design. Such a finding does not negate the ethnomedical experience; rather it reaffirms Kleinman et al.’s (1978) observations of the differences to be expected between ethnomedical and biomedical explanatory models. The task for applied medical anthropologists will be to address the issue of the relationship of susto and diabetes through the building of bridges of understanding between the ethnomedical and biomedical models of diabetes etiology. And applied medical anthropologists must continue to evaluate ethnomedically derived hypotheses of
etiological relationships (and other aspects of ethnomedical explanatory models) to determine what associations do exist between ethnomedical models and those of biomedicine. We hope the methodological approach presented in this paper will prove useful as we all continue in this endeavor.

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