

# THE RELATIONSHIP BETWEEN DIABETES SELF-EFFICACY AND DIABETES SELF-CARE IN AMERICAN INDIANS AND ALASKA NATIVES

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*Abstract: The objective of the present study was to investigate how American Indian/Alaska Natives' (AI/ANs') attitudes and beliefs might influence how they experience and manage diabetes, with particular attention paid to their attitudes about disease causality. An AI/AN sample of 119 participants completed an anonymous survey that examined the impact of judgments of personal responsibility for disease onset, anger, self-blame, social support, and diabetes self-efficacy on diabetes self-care. Our primary model was tested using structural equation modeling. Results indicated that, while many participants considered themselves almost entirely responsible for their disease onset, this judgment did not predict anger. Anger was strongly related to self-blame and social support, while diabetes self-efficacy was strongly related to diabetes self-care. These psychosocial variables accounted for 70% of the variability in self-reported disease management.*

In 2010, there were an estimated 285 million adults with diabetes worldwide; some researchers expect that by the year 2030, that number will rise to 439 million (Shaw, Sicree, & Zimmet, 2010). The alarming growth rate and the existence of life-threatening complications (e.g., heart disease, kidney disease) underscore the need for a more complete understanding of the intricacies of appropriate diabetes self-care. Moreover, diabetes disproportionately affects particular minority groups (e.g., Latino/as, African Americans, American Indians and Alaska Natives [AI/ANs]), and imposes a heavy burden in terms of the risk of complications and mortality (Burrows, Geiss, Engelgau, & Acton, 2000). In AI/AN communities, diabetes is considered a particularly significant public health issue. Burrows et al. (2000) found that between 1990 and 1997, the prevalence of diagnosed diabetes among AI/ANs increased by 29%. Within a similar timeframe, the prevalence of diabetes in AI/AN adolescents rose by a startling 68% (Acton et al., 2002). These trends highlight the importance of understanding and promoting lifelong diabetes self-care strategies in AI/AN communities. The

objective of the present study was to examine how AI/ANs' attitudes and beliefs might influence how they experience and manage diabetes, with particular attention paid to their attitudes about disease causality and personal responsibility for disease onset.

### **Judgments of Personal Responsibility for Diabetes Onset**

Diabetes is a potentially preventable and controllable disease, and research indicates that lifestyle change can be effective in preventing and/or delaying the onset of type 2 diabetes (Diabetes Prevention Program Research Group, 2002; Knowler et al., 2009). Based on this evidence, one governmental initiative, *Healthy People 2020*, encourages personal responsibility for reducing the risks and complications associated with diabetes (U.S. Department of Health and Human Services, 2011). Positive individual lifestyle choices, such as healthy eating and engaging in regular physical activity, are emphasized. But this type of initiative necessitates a more complete understanding of the cognitive, emotional, and sociocultural challenges and consequences of being held accountable for one's own health status.

There are at least two ways that information about personal responsibility for disease onset might influence individuals who have diabetes. First, information about disease causality might influence diabetes patients from an *interpersonal* perspective, or how others perceive them. Weiner's (1995) theory of social motivation provides a theoretical framework to examine beliefs about personal responsibility from this perspective. Weiner (1995) argued that, if there is a judgment that a particular person was the cause of a negative event, an inference that the cause was controllable, and an absence of mitigating circumstances, the individual will be judged by others to be responsible for the event onset. Weiner contends that being judged personally responsible for the onset of a negative event (e.g., diabetes) could lead others to be angry and assign blame, and could influence the person's subsequent behavior. Weiner, Perry, and Magnusson (1988) found that perceptions of personal responsibility for the onset of a variety of medical conditions (e.g., obesity, drug addiction, AIDS) were associated with more anger and blame, decreased liking, and a reduced magnitude of charitable assistance and helping behavior offered to the target.

Second, information about disease causality might influence how diabetes patients perceive themselves. A study that examined Weiner's (1995) model from an *intrapersonal* perspective found that individuals' perceptions of their personal responsibility for disease onset were significantly related to anger and self-blame (DePalma, Rollison, & Camporese, 2011). This study, however, was conducted with a small sample of largely non-Hispanic White participants; thus, the generalizability of this model to other populations remains untested.

### **Judgments of Personal Responsibility for Diabetes Onset in AI/AN Groups**

Many AI/ANs believe that diabetes within their community is a result of the Westernization that occurred during the 19th and 20th centuries, which led to a loss of their traditional healthy diet (Devlin, Roberts, Okaya, & Xiong, 2006; Dillinger, Jett, Macri, & Grivetti, 1999). However, some AI/ANs do assign judgments of a more personal responsibility for diabetes onset, and these explanations may play an important part in disease management. In a study of AIs living in New Mexico Pueblo communities, mentors/educators suggested that the belief that one was personally at fault for his or her diabetes onset was associated with a fear of social stigma and feelings of personal shame (Griffin, Gilliland, Perez, Upson, & Carter, 2000). These factors, in turn, were thought to have discouraged participation in healthy lifestyle education sessions (Griffin et al., 2000). Thus, self-blame and fear of social stigma may negatively impact health promotion efforts associated with diet, exercise, and preventive health screening.

### **Interpersonal Relationships**

Weiner contends that there are important social implications for individuals held accountable for a negative event; these individuals tend to elicit greater anger and blame from the people in their environment, and they tend to get less help and are liked less (Corrigan, Markowitz, Watson, Rowan & Kubiak, 2003; Weiner, 1995; Weiner et al., 1988). For these reasons it is important to examine the social implications of being held responsible for one's own diabetes onset. One dynamic feature of interpersonal relationships is the provision of social support, which has been found to be significantly related to diabetes self-care (Schafer, McCaul, & Glasgow, 1986). Supportive behaviors from friends, family, or significant others may include praise for following a healthy diet or an expressed willingness to exercise together (Lewin et al., 2005). Nonsupportive behaviors, or negative social support, may include criticism for not exercising regularly or nagging about blood glucose testing (Lewin et al., 2005). AI/AN family and community members have been shown to impact diabetes management by providing a supportive environment that encourages increased physical activity (Thompson, Wolfe, Wilson, Pardilla, & Perez, 2003). Conversely, familial constraints also have been shown to be incompatible with many AI/AN women's personal decisions to adopt a healthier diet or seek preventive screening services (Taylor, Keim, Sparrer, Van Delinder & Parker, 2004; Thompson et al., 2003). Individuals with diabetes who reported more nonsupportive social behavior from significant others also reported less effective diabetes self-care behavior (DePalma et al., 2011).

### **Predicting Diabetes Self-Care Behavior: The Role of Self-Efficacy**

From an intrapersonal perspective, increased self-blame, in conjunction with the perceptions of nagging and criticism may serve to erode self-efficacy. Self-efficacy is confidence in one's ability to perform a particular behavior, and is expected to influence the likelihood of behavioral occurrence (Bandura, 1977). For example, if a significant other repeatedly argues with a diabetes patient about disease management, disparages the patient for not testing his/her blood sugar appropriately, or criticizes the patient for not exercising regularly, it may erode the patient's confidence in his/her ability to manage the disease appropriately.

Individuals with lower levels of self-efficacy have been shown to be more likely to perceive diabetes self-care activities as a burden (Weijman et al., 2004), and evidence indicates that enhancing self-efficacy can result in more effective diabetes management (van de Laar & van der Bijl, 2001). According to several researchers, self-efficacy may be a critical indicator of diabetes self-care (King et al., 2010; Nouwen et al., 2011; van de Laar & van der Bijl, 2001). Two qualitative studies with small AI/AN samples have examined the role of self-efficacy in diabetes management. In a sample of 22 AI/AN women with gestational diabetes, Jones et al. (2012) expressed concern that AI/AN women may not have confidence that they can prevent or delay the onset of diabetes. In a sample of 18 AI/AN adults, Shaw, Brown, Khan, Mau, and Dillard (2013) identified social support and self-efficacy as two central resources to increase the likelihood of positive health outcomes.

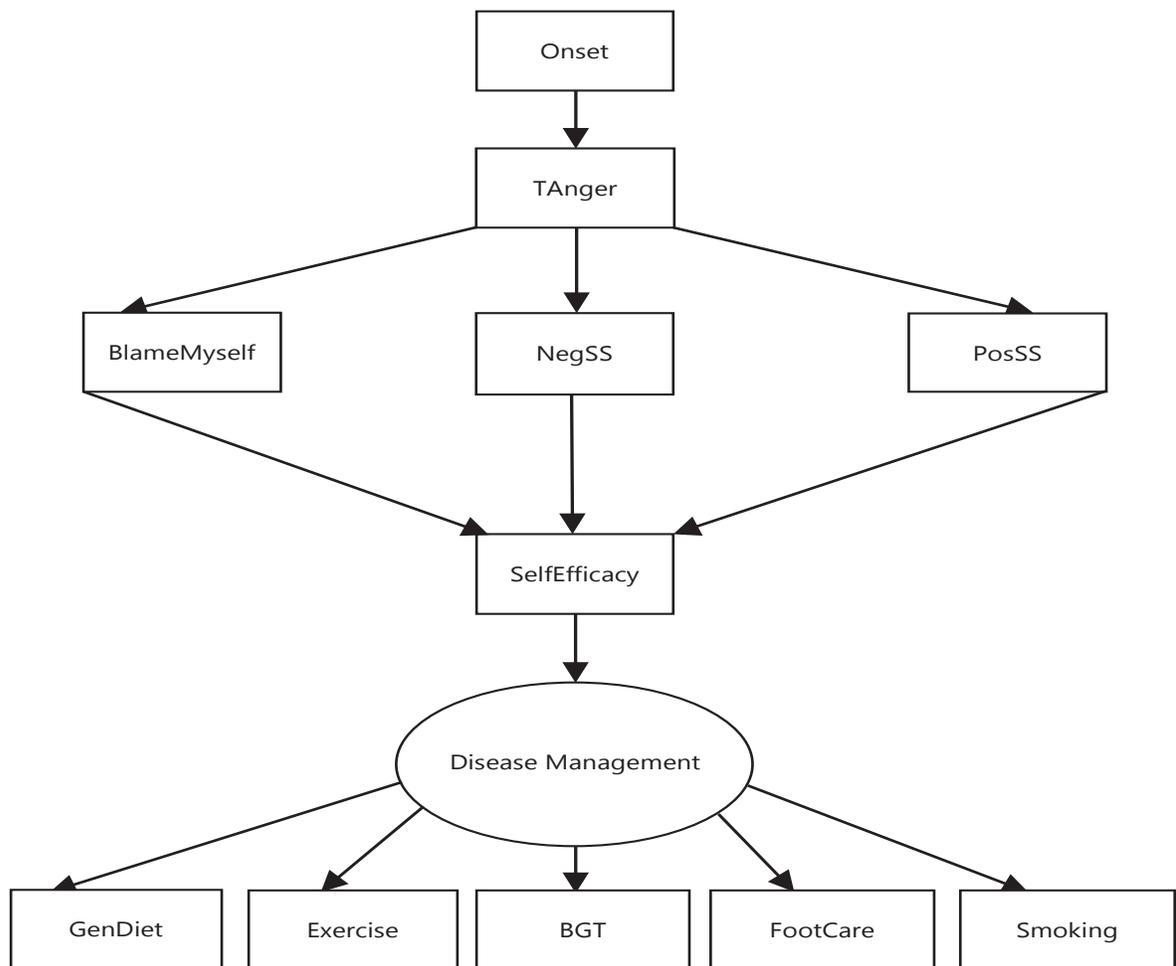
### **Depression**

Depressive symptoms often are comorbid with diabetes (Li, Ford, Strine, & Mokdad, 2008), and depression is almost twice as common in adults with diabetes than in those without diabetes (Gonzalez et al., 2007). Gonzalez and colleagues (2007) found that major depression was significantly related to poor adherence to a number of self-care behaviors, including dietary recommendations and exercise, and to less frequent self-monitoring of blood glucose. Those individuals who reported some depressive symptoms, but did not meet the criteria for major depression, still showed lower adherence to self-care behaviors, suggesting that even mild depressive symptoms may diminish disease management. Li et al. (2008) examined data from the 2006 Behavioral Risk Factor Surveillance System and reported that the rate of major depression was 27.8% for AI/ANs—the highest rate among all ethnic groups identified. Depression may impede successful diabetes self-care behaviors in AI/AN communities, and is important to assess.

## Hypotheses

The objective of the present study was to examine, from an intrapersonal perspective, how AI/ANs' perceptions of disease causality might influence how they affectively experience and behaviorally manage their diabetes. As can be seen in the proposed model in Figure 1, we hypothesized that an individual's initial judgment of personal responsibility for diabetes onset would lead to increased self-blame and anger. The increased anger also would be associated with greater perceived nonsupportive social behavior. These increases in nonsupportive social behavior would, in turn, be associated with decreases in diabetes self-efficacy. Diabetes self-efficacy was hypothesized to be the mechanism through which these psychosocial variables would ultimately influence diabetes self-care. We also explored whether increases in self-blame and decreased diabetes self-efficacy might be associated with depression.

**Figure 1**  
**Model Representing the Proposed Relationship Between Judgments of Responsibility for Disease Onset, Trait Anger, Self-blame, Perceived Social Support and Self-efficacy and Disease Management**



## METHODS

### Procedure

Approval for this study was obtained from the College Review Board for Human Subjects Research at Ithaca College. Participants were recruited from those in attendance at a conference in North Dakota on issues related to AI/ANs and aging. A member of the Native American Council on Native American Aging provided tabled information to conference attendees, including information about personal care, home health care, respite care, and referral services. Posters were attached to the information table that advertised the survey in order to recruit participants. Participation was restricted to individuals with diabetes who were 18 years of age or older. The participants filled out a voluntary, anonymous paper-and-pencil survey, which took approximately 20 minutes. Participants placed their completed surveys in a drop box and were given a \$5 gift card in appreciation of their participation.

### Participants

Of the 119 individuals who participated, 117 self-identified as AI or AN. Two individuals did not self-report this information, but their inclusion did not change any result.

### Materials

The survey consisted of scales measuring judgments of personal responsibility for disease onset, anger, self-blame, perceived supportive and nonsupportive social behaviors, diabetes self-efficacy, and disease management. Participants also were asked to self-report race, and chose the option: American Indian or Alaska Native. Disease type was measured by asking participants “With which type of diabetes have you been diagnosed?” (type 1, type 2, I don’t know, or I don’t have diabetes). Participants also reported other basic demographic information (e.g., age, education, marital status, height, and weight). Finally, participants responded to questions measuring depression. The reliability of the multi-item scales used in the survey also was assessed; the mean, standard deviation, and reliability for each scale can be found in Table 1. Reliability analyses indicated satisfactory internal reliability across all measures.

**Table 1**  
**Descriptive Statistics for Factors Related to Disease Management**

Variable	Number of Items	Sample Score Range	Means	SD	Cronbach's Alpha
Personal Responsibility - Onset	1	0-10	7.49	3.23	-
State-Trait Anger Expression Inventory-2 - Trait Anger	10	10-39	14.29	4.60	.89
Self-blame	1	1-4	1.96	1.00	-
Diabetes Family Behavior Checklist - Positive	9	9-36	17.90	6.87	.78
- Negative	7	7-24	12.14	4.77	.74
Self-efficacy	7	0-10	6.15	2.73	.90
Center for Epidemiologic Studies Depression Scale	20	0-32	14.22	7.62	.77
Summary of Diabetes Self-care Activities (SDSCA) - General Diet	2	0-7	4.50	1.96	.82
SDSCA - Blood Glucose Testing	2	0-7	4.24	2.55	.91
SDSCA - Foot Care	2	0-7	4.72	2.39	.75
SDSCA - Exercise	2	0-7	3.08	2.41	.83
SDSCA - Smoking Status	1				
Yes	20.2%				
No	79.8%				

## Primary Measures

### Personal Responsibility and Self-Blame

Judgments of personal responsibility for disease onset was assessed by asking: “How responsible do you perceive yourself to be for the onset of your diabetes?” Responses ranged from 0 (*not at all responsible*) to 10 (*entirely responsible*). DePalma et al. (2011) adapted this item from Weiner’s (1995) measures to represent a very specific personal responsibility for diabetes onset.

Consistent with the work of Karlsen and Bru (2002), self-blame was measured by asking: “How do you generally react when you experience diabetes-related stressful events: I blame myself” with response options ranging from 1 (*I usually don’t do this at all*) to 4 (*I usually do this a lot*). To our knowledge, neither of these measures has been used in AI/AN samples.

### **Anger**

The 10-item Trait-Anger subscale of the State-Trait Anger Expression Inventory-2 (Spielberger, 1999) was used to measure trait anger. Ten items assessed the degree to which an individual expressed both an angry temperament (e.g., “I am quick tempered”) and an angry reactionary style (e.g., “It makes me furious when I am criticized in front of others”). Scores range from 10-40, with internal reliability ratings surpassing .80 (Spielberger, 1999). This measure has been used successfully before in an AI/AN population (Schultz, 2006).

It was important to measure dispositional anger; that is, we wanted to know how these people believe they are *generally* (trait anger), not at a particular moment in time (state anger). Dispositional anger could create an important (and continuous) interaction with the social environment—particularly with those people who are providing social support.

### **Social Support**

The Diabetes Family Behavior Checklist (DFBC) was selected as a diabetes-specific measure of family support of, or interference with, the diabetes self-care regimen (Schafer et al., 1986). In this 16-item scale, each item is rated on a scale of 1 (*never*) to 5 (*at least once a day*). Two separate subscales reflect perceived supportive or positive social support behaviors (e.g., encouragement and praise; 9 items) and nonsupportive or negative social support behaviors (e.g., nagging and criticism; 7 items). The nonsupportive subscale has been shown to correlate concurrently and prospectively with adherence to glucose testing, diet, and insulin injections; supportive DFBC scores were not related to these adherence measures (Schafer et al., 1986). Schafer et al. (1986) report that test-retest reliabilities ranged from .69 (nonsupportive) to .84 (supportive). Lewin et al. (2005) replicated the two-factor structure of the DFBC, and reported high internal consistency (Cronbach’s  $\alpha = .71$  to  $.79$ ). This measure of social support is rarely used with AI/AN adult samples, but Jiang et al. (2012) administered a 4-item subset to a very large sample of AI/AN participants, and reported reasonable internal consistency (Cronbach’s  $\alpha = .64$ ).

### **Self-Efficacy**

While there are global measures of general self-efficacy, measures also exist for more specific diabetes self-efficacy. Diabetes self-efficacy was measured using “Section III - Self-Efficacy” of the Multidimensional Diabetes Questionnaire (MDQ; Talbot, Nouwen, Gingras, Gosselin, & Audet, 1997). This scale consists of 7 items assessing how confident the participant is in his or her ability to perform specific diabetes self-care tasks (e.g., “How confident are you in your ability to follow your diet?” and “How confident are you in your ability to test your blood sugar at the recommended frequency?”). Talbot et al. (1997) ratings ranged from 0 (*not at all confident*) to 100 (*very confident*). In the present study, to be more consistent with the presentation of other similar included items,

each item is rated on a scale of 0 (*not at all confident*) to 10 (*very confident*). That is, we changed the numerical response options, retained numbers on a comparable scale, and retained the identical text anchors. Although the psychometric properties of the MDQ have not been reported in AI/AN populations, Sacco and Bykowski (2010) report Cronbach's alpha of .90 in their study of 124 diabetes patients.

### **Disease Management**

The Summary of Diabetes Self-Care Activities Measure (SDSCA) is an 11-item self-report scale with 6 subscales designed to assess important components of diabetes self-care: general diet (2 items), specific diet (2 items), exercise (2 items), blood glucose testing (2 items), foot care (2 items), and smoking status (1 item; Toobert, Hampson, & Glasgow, 2000). For example, participants are asked, "On how many of the last seven days did you participate in at least 30 minutes of physical activity?" In an analysis of 7 studies using the SDSCA, Toobert et al. (2000) report acceptable inter-item correlations ( $M=0.47$ ) and moderate test-retest correlations ( $M=0.40$ ). These authors, however, indicate that the specific diet subscale consistently exhibits poor psychometric properties, as did findings from the present study (Cronbach's  $\alpha = .19$ ). As a result, the specific diet subscale was excluded from the present study, leaving 5 remaining subscales: general diet, exercise, blood glucose testing, smoking, and foot care (Toobert et al., 2000). To our knowledge, this measure has not been reported in an AI/AN sample.

### **Secondary Measures**

#### **Body Mass Index (BMI)**

Participants were asked to self-report height and weight. Using this information we were able to estimate BMI using Quetelet's index, which is body weight (in pounds) divided by stature (in inches squared; Gallagher et al., 1996).

#### **Depression**

The Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) was used to measure depression. This scale has been shown to have high internal consistency and presents 20 items to assess the way the participant has felt during the past week (Radloff, 1977). Each item is rated from 0 to 3, where 0 = *Rarely or none of the time (less than 1 day)* and 3 = *All of the time (5-7 days)*; total scores can range from 0 to 60, with higher numbers indicating higher levels of depression. A meta-analysis conducted by Kim, DeCoster, Huang, and Chiriboga (2011) provides evidence that the factor structure of the CES-D replicates across racial/ethnic groups—a comparison which included AI samples.

## Design and Analysis

We begin with a presentation of descriptive statistics of our demographic data, and include reliability analyses. We then turn to our inferential analyses. Our primary model was tested using structural equation modeling with AMOS 21.0. Given an existing theoretical model that is represented by a series of structural equations, this analytic method enables a simultaneous assessment of the overall model. Because the psychometric properties of our disease management measure (SDSCA) have not been reported in AI/AN samples, a two-stage testing sequence included first conducting a confirmatory factor analysis that tested the adequacy of the measurement model for this measure. We then tested the full latent variable model. Because there is no single accepted measure of model fit, several criteria were used to assess model fit and parsimony, including a non-significant chi-square, a high goodness of fit index, and low root mean square error approximation, which generally indicate an acceptable model (Hooper, Coughlan, & Mullen, 2008).

## RESULTS

### Descriptive Information

Sociodemographic and descriptive information about the sample can be found in Table 2. The sample largely consisted of older females with type 2 diabetes who were married/partnered. Participants were between the ages of 41 and 85 years ( $M = 65.78$ ,  $SD = 8.24$ ). The sample included 18 men and 98 women (three did not report their sex). The average level of education attained was some college credit, but less than one year; education ranged from completion of the 7th grade to the attainment of a doctoral degree.

After applying a Bonferroni correction factor for multiple comparisons (Darlington, 1990), the measures of BMI, education, gender, and marital status were not related to any of the variables in the structural model, nor were they related to the latent construct of diabetes management. As age increased, however, diabetes self-efficacy increased ( $r = .36$ ,  $p < .001$ ,  $\eta^2 = .13$ ).



### Judgments of Personal Responsibility for Diabetes Onset

The participants' mean rating for how responsible they feel for the onset of their diabetes was 7.49 ( $SD = 3.23$ ). In fact, 44.5% of participants rated themselves as *entirely* responsible for the onset of their diabetes. Disease type (type 1 [ $M = 8.10$ ] or type 2 [ $M = 7.36$ ]) was not related to perceptions of personal responsibility for disease onset [ $F(2, 103) = .31, p > .05$ ], and the associated effect size hovered near zero ( $\eta^2 = .006, \text{power} = .10$ ).

### Secondary Measure: Depression

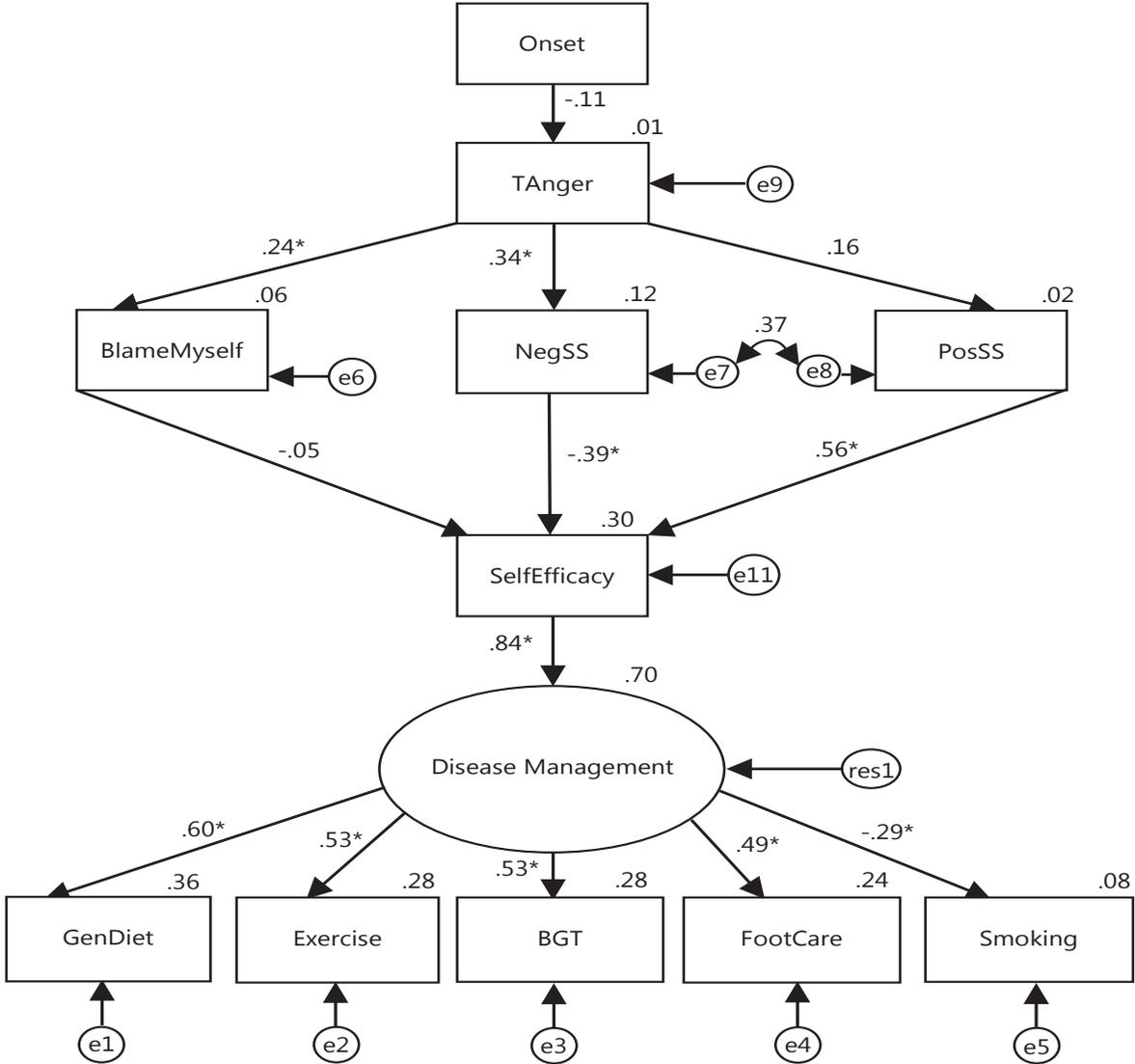
For the 81 subjects who completed the CES-D in full, scores ranged from 0-32 ( $M = 14.22, SD = 7.62$ ). Analysis of the frequency distribution indicated that 37% of this sample was above the cutoff score of 16, which is typically suggestive of depression (Kim et al., 2011). Furthermore, although depression scores were uncorrelated with perceptions of personal responsibility for disease onset ( $r = -.06, p > .05, \eta^2 = .004$ ), self-blame ( $r = .22, p > .05, \eta^2 = .04$ ), and diabetes self-efficacy scores ( $r = -.19, p > .05, \eta^2 = .04$ ), depression scores were positively related to trait anger ( $r = .39, p < .01, \eta^2 = .15$ ) and negative social support ( $r = .29, p < .025, \eta^2 = .08$ ).

### Inferential analyses

#### SDSCA Confirmatory Factor Analysis (CFA)

The initial measurement model was evaluated using CFA techniques to predict the latent construct of disease management from the five subscales of the SDSCA (see Figure 2). Model fit statistics indicated an acceptable fit, and offered no reason to reject the model,  $\chi^2(5) = 5.3, p = .38$ ; TLI = .97, CFI = .99, PCFI = .33, RMSEA = .02, Hoelter .01 = 336. As can be seen in Figure 2, measures associated with general diet, exercise, blood glucose testing, foot care, and smoking were all significantly related to the latent construct of disease management. This model is consistent with the expectation that these variables would be reliably related to diabetes self-care, and provides support for the underlying structure of the SDSCA as a measure of disease management in AI/AN samples. No theoretically meaningful modification indices were offered. This model was accepted as an adequate representation of disease management; therefore, the full latent variable model was constructed.

**Figure 2**  
**Structural Equation Model Representing the Relationship between Judgments of Responsibility for Disease Onset, Trait Anger, Self-blame, Perceived Social Support and Self-efficacy and Disease Management<sup>1,2</sup>**



<sup>1</sup> Numerical output includes the standardized regression coefficients and the squared multiple correlations  
<sup>2</sup> e1-e11 represent error terms, and res1 is the residual associated with the latent construct of disease management  
 \* Significant pathways

**The Full Latent Variable Model**

The structural model represented the proposed relationship among perceptions of personal responsibility for disease onset (ONSET), anger, and self-blame (Weiner, 1995). It also incorporated the two subscales of the DFBC to represent supportive (PosSS) and nonsupportive (NegSS) social behavior, and presented diabetes self-efficacy as the mechanism by which these variables influence

diabetes management (see Figure 2). Figure 2 reports the standardized regression coefficient for each path, as well as the proportion of variance explained. The initial model indicated an adequate model fit,  $\chi^2(41) = 42.99, p = .39$ ; TLI = .98, CFI = .98, PCFI = .61, RMSEA = .02, Hoelter .01 = 180. Exploratory analyses indicated that, although depression was significantly related to anger, the incorporation of depression into the model produced inferior and unacceptable models. Similarly, depression was not significantly related to the latent construct of disease management (C.R. = -1.207,  $p = n.s$ ); as a result, this variable was excluded from consideration in this model.

Contrary to our hypotheses, judgments of personal responsibility for disease onset failed to have a significant effect on any variable. Specifically, the results revealed no significant relationship between participants' perceptions of personal responsibility for diabetes onset and feelings of anger, and the associated effect size hovered near zero ( $\eta^2 = .006$ , power = .12). Given the proportion of participants who endorsed complete personal responsibility for diabetes onset, we performed an exploratory log transformation to normalize the variable. Even under these circumstances, there was still no significant relationship between perceptions of personal responsibility for diabetes onset and anger, and the effect size again hovered near zero ( $r = .06, p > .05, \eta^2 = .004$ ).

Participants' level of anger, however, was significantly and positively related to self-blame and to increased perceived nonsupportive social behavior. No significant relationship between anger and perceptions of positive social support emerged. As perceptions of nonsupportive social behavior increased, diabetes self-efficacy decreased. Diabetes self-efficacy was strongly related to disease management, and, as can be seen in Figure 2, the six psychosocial variables in the model together explained 70% of the variance in self-reported disease management.

## DISCUSSION

Judgments of personal responsibility for a negative event are hypothesized to produce anger, which then influences subsequent behavior (Rudolph, Roesch, Greitemeyer, & Weiner, 2004). Research has supported the causal nature of this cognition-emotion-behavior sequence, including a meta-analysis of helping behavior which examined dozens of studies (Rudolph et al., 2004). However, much of this research is of an interpersonal nature; the work largely examines the impact of cognitions and affect on judgments about, and social behavior toward, others. Although an intrapersonal application of this modeled sequence has been supported in a small sample of non-Hispanic White participants (DePalma et al., 2011), it is not consistent with how the present sample of AI/ANs represents their own disease causality. The present results indicate that nearly 45% of the AI/AN sample perceived themselves to be entirely responsible for their diabetes onset; however, this perception was unrelated to anger and diabetes self-care. This is an important finding because

it indicates that different groups may have different cognitive models about disease causality that could influence social behavior (interpersonal) and, ultimately, diabetes self-care (intrapersonal). We believe that these cognitive models are not invariant, and that it is our obligation to acknowledge this, and to refine the utility of the application of these models. The primary issue now will be to identify the relevant differences in these samples that are responsible for the differences in model fit. This investigation could be initiated through qualitative semi-structured interviews within an AI/AN sample. For example, one might investigate the relevance of the concept of “fatalismo” as it relates to these interests (Walker, Smalls, Hernandez-Tejada, Campbell, Davis, & Egede, 2012). The present study serves to highlight the need for continued research that investigates the role that attitudes may play in these modeled cognitive sequences, from both inter- and intrapersonal perspectives.

Notably, AI/AN samples have been largely unrepresented in tests of this model, both in general and with specific reference to diabetes self-care. Many of the studies in this domain focus either on student samples or on non-Hispanic White participants (Henry, Reyna, & Weiner, 2004; DePalma et al., 2011; Weiner et al., 1988). Others do not have sample sizes appropriate to statistically analyzing the cognitive processes across AI/AN groups (Bauerle, Amirkhan, & Hupka, 2002; Cameron, Payne & Knobe, 2010). The present work provides support for a recommendation by Corrigan and Watson (2007), who suggest oversampling of ethnic subgroups that have not been represented, or have been underrepresented, in tests of various cognitive models.

While greater perceptions of personal responsibility for disease onset might be expected in individuals with type 2 diabetes, disease type (type 1 or type 2) was unrelated to perceptions of personal responsibility for disease onset in the present study. Although there were substantially unequal sample sizes, perceptions of personal responsibility were slightly greater in participants with type 1 diabetes; however, this trend did not approach significance. Ultimately, however, it is important to recognize that the actual disease type is not as important to the current research as is the *perception* of personal responsibility. Interestingly, in this AI/AN sample, perceptions of personal responsibility for disease onset were of little consequence to other measured variables.

The distinction between perception of personal responsibility for disease onset and disease treatment is of considerable importance. However, the impetus for the present study was to understand the implications of being held accountable for the *onset* of one’s own health status. While perceptions of personal responsibility for disease treatment might actually be considered more important given that disease onset has already occurred, we were primarily directed at first understanding the nature of the influence of information about disease causality on disease management.

The present findings regarding the importance of appropriate social support closely replicate the results of previous investigations (Taylor et al., 2004; Thompson et al., 2003), but they do so in an AI/AN sample. The data suggest that social support systems could increase praise and encouragement and reduce nagging and criticism to promote better disease management. This finding appears with some consistency across cultural backgrounds, and within intra- and interpersonal domains.

Adding diabetes self-efficacy to the model significantly improves the prediction of diabetes self-care. Sarkar, Fisher, and Schillinger (2006) provided evidence that the magnitude of the association between self-efficacy and self-management was consistent across racial and ethnic groups; however, only two AI/AN participants were included in their sample of 408, making comparisons with this group impossible. Thompson et al. (2003) found that self-efficacy was important in their sample of largely Navajo and Pueblo participants, but their interest was in relating self-efficacy to physical exercise, and no information about diabetes status was presented. In the present sample, perceived supportive social behavior was positively related to increased diabetes self-efficacy. Participants who reported more praise and encouragement also reported significantly higher diabetes self-efficacy. Conversely, the data indicate that nonsupportive social behavior was significantly related to decreased diabetes self-efficacy, and AI/ANs' diabetes self-efficacy was strongly related to self-reported diabetes management. Theoretically, nagging and criticism could erode an individual's confidence in his/her ability to manage the disease, thereby diminishing diabetes self-care behavior.

Beyond the theoretical importance associated with studying attitudes about disease causality, there is also tremendous practical importance to studying the same. These data suggest that behavioral and psychosocial interventions or educational initiatives designed to incorporate information about disease causality could have an entirely different impact across groups, or perhaps have no impact at all. For example, the present data suggest that any educational initiatives designed to address information about disease causality could have little influence on the self-care behavior of these AI/ANs; instead, these data strongly suggest that educational initiatives should focus on improving social support and diabetes self-efficacy. Given the alarming rise in diabetes in AI/AN communities—particularly in adolescents—there is a clear and demonstrable need for effective biomedical and psychosocial interventions that can help improve lifelong diabetes self-care; initiatives that need to be established as effective in AI/AN populations.

Despite the strengths of this study, there are also limitations, including an overreliance on self-report. Self-report may not be entirely accurate, and may be subject to the influence of social desirability biases. Studies of this design also run the risk of suffering from issues related to common method variance, which is the spurious variance attributed to the common measurement method rather than to the constructs themselves (Chang, van Witteloostuijn, & Eden, 2010). It is important to note, however,

that our decision to use different scale types with different endpoints for the predictor and criterion measures limits those concerns, as does the examination of a more complex model which is unlikely to be obvious to the participants (Chang et al., 2010). Nonetheless, supplemental measures more closely related to actual disease management (e.g., A1c levels) would increase confidence in these findings.

Similarly, future research should include item calibration components and consider the replacement of single-item measures with multi-item measures where necessary. Single-item measurement is widely considered acceptable for factually based information like demographic data, but is not considered appropriate for multidimensional, heterogeneous, and complex constructs like “personality.” In the present case, a single-item measure of judgment of personal responsibility was considered appropriate, as the item is sufficiently narrow in its scope, and is theoretically attempting to capture only one aspect. Likewise, judgment of personal responsibility and self-blame measures represent the subjective experience of a single event in time. Of course, single-item measurement is also more practical. Because depression was of secondary interest and not involved in our model, the depression measure was placed at the end of our survey. Only 81 participants fully completed this measure. This could be an indication of excessive burden from the length of the survey, or it could have been specific to participants being uncomfortable answering sensitive questions about depression status. In either case, the results regarding depression should be interpreted with caution, as there may have been some response bias. Future research must achieve a healthy balance so that surveys are as brief and efficient as possible so as not to burden participants, yet the psychometric quality of the instruments must be preserved.

It is also important to note that the present convenience sample consisted primarily of older AI/AN women; thus, a better representation of age range and gender would improve the generalizability of these findings. The Hoelter indices near 200 (the structural model) or well above 200 (the measurement model) indicate that the sample size was satisfactory. However, given the cross-sectional design, only a recursive model was estimated. For example, it is possible that increased nonsupportive social behavior could increase anger, which could increase nonsupportive social behavior, creating a cycle that continues to adversely influence diabetes self-care. While structural equation modeling techniques evaluate proposed theoretical models, they cannot rule out the existence of alternative models. Given that these data are correlational in nature, there certainly continue to be ethical constraints that limit the degree to which any of these variables could—or should—be manipulated experimentally.

Diabetes is a significant health threat to AI/AN communities. It can be a burdensome disease to manage, and social support may be remarkably advantageous in meeting the challenges associated with diabetes self-care. In AI/AN communities, interventions designed to improve the presence and perception of available social support may be beneficial. These data also suggest that

bolstering diabetes self-efficacy would be important, as it is strongly related to diabetes self-care. The present data provide evidence that interventions designed to improve self-efficacy associated with blood glucose monitoring, diet adherence, and exercise may prove especially important to diabetes self-care in AI/AN communities.

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