Diabetes is one of the leading health problems in the United States. It has recently attained the dubious distinction of becoming the fifth leading cause of disease-related death (Hamburg, Elliott, & Parron, 1982). Diabetes is generally characterized as existing in two major forms: (a) insulin-dependent (Type I), and (b) noninsulin-dependent (Type II). The latter appears to be the more common, accounting for 80% of all diabetic cases (Hamburg et al., 1982).

Types I and II diabetes differ in regard to several factors. Knowler, Pettitt, Bennett, and Williams (1983) describe Type I, or insulin-dependent diabetes, as a condition in which the administration of exogenous insulin is needed in order to keep the diabetic patient from developing ketoacidosis and eventually dying. They describe other factors associated with Type I diabetes as being the presence of pancreatic islet cell antibodies and acute symptom onset. Type II diabetes, according to Knowler et al. (1983), shows a resistance to ketosis, absence of pancreatic islet cell antibodies, and either the lack or slow development of overt symptoms.

From an etiological perspective, Knowler et al. (1983) further address the differences between Types I and II diabetes:

In causal terms, the major distinction between the two types appears to involve insulin. In type I diabetes, the basic physiologic problem is the lack of insulin. In type II diabetes, the basic physiologic problem appears to be the resistance to the action of insulin, inappropriate insulin secretion or a combination of the two. Because of the different basic defects in the two types and because of the evidence from twin concordance and family studies suggesting different degrees of heritability and modes of inheritance, the two types of diabetes are generally considered causally distinct. (p. 108)

As in the general population, Type II diabetes accounts for the majority of diabetic cases among a variety of American Indian tribes. Such tribes as the Cherokee, Choctaw, Comanche, Creek, Kiowa, Pawnee, Pima, and Seminole have all been observed to have significant diabetic problems (Drevets, 1965; Joos, 1984; Knowler et al., 1983; Mayberry & Lindeman, 1963; Sievers & Fisher, 1981). Diabetes has also been indicated as being a significant problem among such Canadian tribes as the Ojibway and Cree (Hagey, 1984). Reports from the 1940s and 1950s indicate that, although the prevalence rates of diabetes vary across tribes, the overall American Indian diabetes-related death rate was apparently not significantly different from that of the general population.
More recently, however, the prevalence of diabetes has increased across tribes: the American Indian diabetes-related death rate has increased to 2.3 times that of the general population by 1967 (Hill & Spector, 1971; Knowler et al., 1983; Sievers & Fisher, 1981; West, 1978). It is of interest to note that although diabetes was becoming a significant problem for such tribes as those listed above by the early 1960s, it appears to have been a rare condition among the White Mountain Apache (Clifford, Kelly, Leo, & Eder, 1963).

Diabetes, in turn, appears to be an etiological factor in other health problems including disorders of the eyes, kidneys, and cardiovascular system (Joos, 1984). Strotz and Shorr (1973), for example, found a significantly higher incidence of hypertension among Papago diabetics than among Papago nondiabetics. Bennett, Knowler, Pettitt, Carraher, and Vasquez (1982) and Pettitt, Knowler, Lisse, and Bennett (1980) reported an association between diabetes, renal disease, and proteinuria among the Pima. However, the relationships between diabetes and other health complications among American Indians remain somewhat unclear, as suggested by Prosnitz and Mandell’s (1967) report in which they found no vascular complications among Navajo and Hopi diabetics.

The Pima are one of the most studied populations regarding diabetes, not only among American Indians, but in the world (Bennett, Burth, & Miller, 1971; Bennett et al., 1982: Bennett, Rushforth, Miller, & LeCompte, 1976; Knowler, Bennett, Hamman, & Miller, 1978; Knowler et al., 1983). As with other American Indian tribes, type II diabetes is the most common form of diabetes among the Pima (Sievers & Fisher, 1981). Much of the research on Pima diabetes has focused on physiological and biochemical features (Aronoff, Bennett, & Unger, 1977; Bennett et al., 1982; Knowler, Bennett, Bottazzo, & Donaich, 1979; Rushforth, Miller, & Bennett, 1979; Savage et al., 1979; Williams et al., 1981). These factors, as well as others, need further study among not just the Pima, but other tribes that have a high prevalence of Type II diabetes and its life-threatening implications.

It is important to consider a variety of factors which contribute to the onset and course of this disease, including psychological and behavioral variables. Such variables have been addressed in the general psychological literature related to diabetes, but have been relatively ignored in the study of diabetes among American Indians. Following a section on etiology, this paper addresses psychological and behavioral variables that may be involved in American Indian diabetes. After discussing the issues of intervention and prevention, research areas are highlighted, and prior to the conclusion of the paper, a prototypic study is proposed.
Etiology

Type II diabetes has an apparent multifactorial etiology. Such variables as heredity, obesity, age, environment, and psychological and behavioral factors have been implicated in the development of the diabetic condition (Joos, 1984; West, 1978). At times, some variables have been implicated to the exclusion of others. It is more likely, however, that a combination of variables make a significant contribution to the development of diabetes. Even so, the question remains as to how much any one factor contributes.

Heredity

One of the major etiological factors considered in type II diabetes is heredity (Bennett et al., 1982; Brosseau, Eelkema, Crawford, & Abe, 1979; Fisher, Delamater, Bertelson, & Kirkley, 1982; Sievers & Fisher, 1981; Wiedman, 1984). Neel (1962, 1982) offers one of the major arguments regarding a heredity or genetic explanation of diabetes. He proposed the "thrifty genotype" hypothesis (1962) which suggests that American Indians were genetically predisposed to fat storage when food supplies were plentiful so that survival increased when food supplies became limited. However, when food supplies became more constant and readily available, as with the advent of White culture, the potential for fat storage (and obesity) increased. As a result, high blood sugar levels and eventual diabetic conditions also increased. More recently, Neel (1982) has indicated that this hypothesis is in need of revision because of the different natures of Types I and II diabetes and the findings on insulin sensitivity and insulin receptor rates.

In a similar discussion, Wiedman (1984), echoing Neel’s logic, referred to a "Type II diabetic genotype" and suggested that traditionally hunting and gathering populations are predisposed to diabetes because of this genotype. According to Wiedman, the adverse effects emerge in the presence of acculturation and diet change. This position was the basis of explanation for the significant increase in diabetes among Cherokee living in Oklahoma, which cited the shift from an agricultural to an industrial economy.

In a more direct examination of genetic factors, Brosseau et al. (1979) compared American Indians from Mandan, Arickara, and Hidatsa tribes with a White American sample. The American Indian samples varied by blood quantum. The results from Brosseau and colleagues indicated no significant differences between groups under the age of 35, however, a significant difference was found between groups over 35. Quantum of Indian blood was positively related to prevalence of diabetes: the greater the Indian blood
quantum, the higher the prevalence of diabetes. Individuals who were 50% or less American Indian and White Americans had equal prevalence rates of diabetes.

Bennett et al. (1982) and Knowler et al. (1983) place great emphasis on the genetic component in the etiology of Pima diabetes. For example, the latter report that the probability of a Pima developing diabetes is directly related to whether or not the parents are diabetic. Knowler et al. (1983) also indicate that the familial relationship is such that diabetes often occurs in as many as four generations of a single family.

There appears to be a strong argument for a genetic explanation of Type II diabetes among American Indians. However, a purely genetic view seems to be inadequate. First, the thrifty genotype hypothesis is in need of sophisticated empirical study. It is not clear whether such a global view is accurate in light of the fact that not all American Indian tribes had a subsistence lifestyle, and yet Type II diabetes is a widespread problem across tribes. Allowing for the likelihood that there is a genotype related to American Indian diabetes, it should not be forgotten that genotypic factors are only a predisposition for the development of certain elements given certain circumstances (i.e., environmental influences).

Although Bennett et al. (1982) and Knowler et al. (1983) view heredity as a major factor in diabetes, they also recognize that environmental factors have some influence. Joos (1984) reports that one factor alone was insufficient to account for the prevalence of diabetes among the Seminole. Joos suggests that factors such as weight, diet, age, gender, activity levels, and pregnancies contribute importantly to the onset of diabetes. West (1973, 1974, 1978) indicates that factors other than heredity are important contributors to the onset of diabetes. In his opinion, most important is obesity.

**Obesity**

Several investigators (Joos, 1984; Judkins, 1978; West, 1978; Wiedman, 1984) suggest that obesity is a highly significant factor in the development of Type II diabetes. West (1973, 1974, 1978) found a high prevalence of obesity among a variety of American Indian tribes, especially those with significant rates of diabetes. He concluded that low activity levels, high food intake, and socioeconomic status are among the factors that seem to influence obesity, which in turn influences diabetes onset. Joos (1984) discovered no dietary differences between obese and non-obese Seminoles, only differences in the amount of calories consumed. West (1973) compared low socioeconomic status American Indians and Black Americans with higher socioeconomic status American Indians, Black Americans, and White Americans. His results reveal that regardless of ethnicity, lower socioeconomic status groups are more overweight than
higher socioeconomic status groups. This finding suggests that in holding socioeconomic status constant, there should be no ethnic/racial differences in terms of obesity. It follows that Type II diabetes may also be linked to socioeconomic conditions.

If such factors as socioeconomic status and obesity have significant influence on Type II diabetes, then given similar socioeconomic status, family histories of diabetes should be related to obesity but not to ethnicity. A small study by the author addresses this question (Pine, 1979). Eighty lower socioeconomic status multiracial urban American Indians and 80 lower socioeconomic status urban White Americans were surveyed as to whether or not they had a family history of diabetes. There were equal numbers of men and women and half of the subjects were classified as obese (15% or more over normal body weight) and half were classified as non-obese (no more than 10% over normal body weight); (Table 1). According to the study, there appears to be some relationship among diabetes, obesity, and familial variables. However, familial variables may not necessarily imply a genetic link. Behaviors can be acquired by observing others (modeling) and family modeling may be a powerful learning tool. The significant result was that no ethnic differences were observed after having controlled for socioeconomic status. If American Indians are genetically predisposed to diabetes, then regardless of socioeconomic status, there should be a higher prevalence of family diabetes within the American Indian sample. This was, however, not the case. The major factor related to a family history of diabetes was obesity.

**Table 1**

<table>
<thead>
<tr>
<th>Family History of Diabetes</th>
<th>Number (percent)</th>
<th>Corrected Chi-Square</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>American Indians</td>
<td>19 (23.8)</td>
<td>0.0</td>
<td>1</td>
<td>1.00</td>
</tr>
<tr>
<td>Whites</td>
<td>19 (23.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>15 (18.8)</td>
<td>1.69</td>
<td>1</td>
<td>.19</td>
</tr>
<tr>
<td>Women</td>
<td>23 (28.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>25 (31.3)</td>
<td>4.18</td>
<td>1</td>
<td>.041</td>
</tr>
<tr>
<td>Non-obese</td>
<td>13 (16.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ethnic comparisons within each weight and gender category</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Obese Men</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indians</td>
<td>4 (20)</td>
<td>.133</td>
<td>1</td>
<td>.72</td>
</tr>
<tr>
<td>Whites</td>
<td>6 (30)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese Women</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indians</td>
<td>7 (35)</td>
<td>0.0</td>
<td>1</td>
<td>1.00</td>
</tr>
<tr>
<td>Whites</td>
<td>8 (40)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-obese Men</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indians</td>
<td>3 (15)</td>
<td>0.0</td>
<td>1</td>
<td>1.00</td>
</tr>
<tr>
<td>Whites</td>
<td>2 (10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-obese Women</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indians</td>
<td>5 (25)</td>
<td>.156</td>
<td>1</td>
<td>.69</td>
</tr>
<tr>
<td>Whites</td>
<td>3 (15)</td>
<td></td>
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</tr>
</tbody>
</table>
A strong family component in diabetes among the Pima has been reported by Knowler et al. (1983) which tends to contradict the results of the study described above. This contradiction is not easily reconciled. However, it is important to consider that the American Indian subjects in the above sample are multiracial and urban. The Pima, on the other hand, are a typical reservation-based homogeneous group, making it difficult to compare the samples. Possibly when dealing with a more homogeneous group, hereditary factors have more influence. Future research should specifically address these issues, especially in regard to tribes other than the Pima. The study presented here is very limited; its main thrust is to emphasize that more than one variable may be involved in the etiology of diabetes, and that future exploration of these issues is necessary.

Psychology and Behavior

The psychological literature has addressed questions about diabetes within the general population, but has virtually ignored this aspect of diabetes among American Indians. There is an emerging literature regarding the psychological aspects of American Indian diabetes and obesity which can be placed within the general psychological literature (Judkins, 1978; Pine, 1983, 1984, 1985).

As etiological factors, psychopathology and emotional stress may play significant roles in the onset of diabetes (Fisher et al., 1982; Hamburg et al., 1982). Fisher et al. (1982), for example, report indications that glucose metabolic regulators are influenced by such problems as psychopathology and emotional stress. However, Surwit, Feinglos, and Scovem (1983) suggest that it is too early to draw any conclusions from the current knowledge base. The latter's caution stems from apparent problems in research design, inconclusive results, and failure to establish a psychological profile of diabetic patients (Surwit et al., 1983):

Psychogenic causation in diabetes is now thought to be untenable. Research necessarily retrospectively has failed to provide adequate empirical support for it...among adult diabetics, research has consistently failed to identify a personality pattern common to the diabetic patients under study. The concept of "pre-diabetic state" which regards diabetes as a latent genetic predisposition that can be induced environmentally, still does not propose a mechanism through which "pre-diabetes" can decompensate into overt diabetes as a result of emotional conflicts. (p. 256)

Although there is some controversy regarding the etiological contribution of psychopathology and emotional stress, recent information suggests that these factors significantly influence the course of diabetes (Cox et al., 1984). Cox and colleagues describe the relationship between stress and diabetes in the following manner:
There are three lines of evidence suggesting the direct effect on the course of diabetes. First, many hormones have been shown to affect carbohydrate metabolism and blood glucose level: cortisol, epinephrine, norepinephrine, growth hormone, glucagon, as well as insulin. All of these hormones are under neural control and have been shown to be significantly affected by psychological stress. Second, positive relationships between stress and the occurrence of "diabetic crisis" have been alluded to in the literature. Third, stress management techniques such as family therapy and relaxation techniques have been shown to aid in diabetic blood glucose control. (pp. 63, 64)

If psychological stress can influence the course of diabetes as reported by Cox et al. (1984), then it seems logical that psychotherapy and stress may have some influence at the etiological level as well. Intermediary factors may exist between psychological or emotional stress and the onset of at least Type II diabetes. Given that obesity appears to play a part in the onset of diabetes, it is of interest to consider the effects of stress on obesity.

In reviewing the literature regarding the relationship between psychological factors and obesity in the general population, Leon and Roth (1977) discussed the emotional arousal theory (EAT) of obesity. This theory predicts that in a high anxious or stressful situation, obese people eat more whereas non-obese people do not overeat. Pine (1985) compared equal numbers of obese and non-obese American Indians (multitribal and urban) and Whites (urban) in regard to EAT (also there were equal numbers of men and women). In general, the study appears to support the EAT theory (high anxiety condition obese ate significantly more than other groups, p > .017). However, when considering ethnic factors, the effect was not found for the American Indian sample. One possible explanation is that the overall experience of participating in the study (regardless of anxiety condition) may have been anxiety producing for the American Indian sample who consequently ate more food regardless of weight. However, this does not explain why some of the American Indians were overweight and some were not. To account for this, the author proposed the Stress Reaction Theory (SRT). Regardless of weight, American Indians may respond to anxiety and stress by overeating (given food is available) and as anxious or stressful situations occur more frequently, intensely, and for longer durations, the potential for obesity increases. Such a theory is in need of further study. But, if anxiety and stress can affect eating behaviors and weight, then given the relationship between obesity and Type II diabetes, anxiety and stress may be a factor in the onset of Type II diabetes (at least indirectly, if not directly). It is possible that such environmental factors as cultural, social, and/or familial influences on eating behavior may have developed in a way in which an individual had the opportunity to observe, learn, practice, and be reinforced for eating in stressful situations, provided the availability of food.

As can be seen by the discussion of psychological and behavioral factors, as well as those related to heredity and obesity, diabetes is a complex problem that, from an etiological perspective, remains somewhat of an enigma. It may also be
that the etiological factors discussed here all play an important role in the onset and course of Type II diabetes, and one factor should not be considered independently. That is, an interaction effect between obesity and hereditary, environmental, psychological, and behavioral factors may exist which then affects the onset and course of diabetes.

**Intervention**

Once diagnosed as being diabetic, the patient is bombarded with educational information, recommendations for exercise and diet changes, and possibly oral medication. Basically, this entails requiring the patient to make permanent life changes in order to control the diabetic condition and to improve his/her health. Often these changes are significantly different from the patient’s lifestyle, thus, not only may diabetes be influenced by psychological factors, but diabetes may in turn influence psychological processes (Fisher et al., 1982). Adjustment issues important for the patient are a focus for psychotherapy; the patient’s family also faces significant adjustment issues. Weakland (1974) refers to family involvement in health and illness as "family somatics." Treating health problems from a family perspective is further emphasized by Coyne and Holroyd (1982).

The treatment of chronic illness is definitely a homecare situation in that only 4% of those who report restrictions of activities are a result of chronic disease or impairment live in institutions: the vast majority live at home. In many chronic conditions, the patients receive less than a total of one day per year in direct contact with doctors and nurses. The rest of the medical care is provided by self, family, and friends. (p. 118)

These issues are especially relevant to the American Indian diabetic. Ryan (1981) has indicated that the family unit is the basic social unit for American Indians and that pressure to conform comes from this unit. This suggests that without family support, any intervention would probably be limited for the American Indian diabetic. A variety of cultural variables may influence the effectiveness of interventions: (a) the ways in which an individual’s family and community are supportive and provide structure, (b) traditional learning practices, (c) social and cultural variables related to eating habits and practices, (d) similarity or lack thereof of traditional foods which would comply with needed diet changes, (e) perceptions of body image and actual prevalence of obesity, (f) traditional/relevant physical activities which may or may not be useful in controlling weight and diabetes, and (g) traditional healing practices. In the author’s clinical experience, these factors appear most often as potential barriers to treatment when not considered in regard to the diabetic American Indian.

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A "typical" American Indian diabetic patient as seen by the author has the following characteristics: (a) female, (b) morbidly obese, (c) at least 40 years of age, (d) mother of a large family, (e) low socioeconomic status, and (f) responsible person for household duties. Joos (1984) has made similar observations of Florida Seminole diabetic patients. Such patients have often had difficulties with treatment compliance regarding their diabetic conditions. Interventions have been based on the prevailing biomedical model and often do not take into consideration cultural issues. As such, the American Indian patient is asked to make major lifestyle changes that may be contrary to the cultural norms of family and community. Joos (1984) found this to be the case with the Florida Seminole. Food and eating are integral to Seminole social and cultural functions (e.g., it may be inhospitable to refuse to eat). Joos (1984) also indicated that biomedical interventions would be abandoned by patients utilizing traditional healing practices, if the former interfered with the latter. For example, change in diet has been mentioned in controlling diabetes, yet recommended diets may not fit with traditional food choices and preparation. These same foods are often expensive. Moreover, a special diet constitutes added work in that the family will not eat the same food, necessitating the preparation of two meals. Under these conditions, such pressures make it difficult at best for the diabetic patient to comply with a medical regimen.

Hence, mainstream biomedical and psychological interventions will likely fail. These kinds of compliance issues appear true not only for American Indians but for diabetic patients in general (Harris, Linn, & Pollack, 1984). Individuals generally will not seek health care or comply with medical regimens unless they possess minimal levels of relevant health motivation and knowledge, view themselves as potentially vulnerable and the condition is threatening, are convinced of the efficacy of the intervention, and see few difficulties in understanding the recommended action... It has been recommended that interventions designed to improve compliance in health behavior be tailored specifically to the individual's health belief. However, since individuals have been shown to possess these beliefs and motives in widely varying degrees and combinations, it is necessary to understand more precisely the origins of such beliefs and the conditions under which they are acquired. Possibly, intervention will eventually be tailored individually not only to a person's health beliefs, but also to the relation between these beliefs and other psychological traits, such as self-esteem, psychiatric symptoms, locus of control, and relevant attitudes. (p. 253, 254)

The issues addressed by Harris and colleagues (1984) are pertinent to the American Indian situation, especially when one considers cultural factors and knowledge related to health issues. Cultural variables and proper education need to be included in treating the individual and the family. Judkins (1978) reported some initial success in influencing the diets of diabetic Senecas by utilizing tribal interests in returning to traditional ways (e.g., refined sugar is not traditional). Hagey (1984) reported traditional stories as useful in explaining and coping with
diabetes among Canadian Ojibway and Cree. Structuring intervention strategies so that they become culturally relevant should help to increase compliance and thereby improve the diabetic’s health.

Based on the above discussion, effective behavioral treatment and prevention of diabetes among the American Indian population requires assessment of the following: (a) social and cultural variables related to eating habits and practices, (b) traditional foods which would comply with needed diet changes, (c) perceptions of body image and actual incidence of obesity, (d) traditional healing practices for possible utilization in treatment and compliance, (e) traditional or relevant physical activities which could be useful as the basis for exercise in controlling weight and diabetes, (f) the ways in which an individual’s family and community are supportive and provide structure, and (g) traditional learning practices. Presenting a health/mental health education program in a culturally relevant way would help the diabetic patient to better understand his/her health and mental health circumstances and to comply with needed lifestyle (behavioral) changes. Individual and family counseling and psychotherapy could also be made more useful by incorporating the consideration of cultural variables. Introducing information on stress management techniques, for example, by using language/expressions easily understood and accepted by the people should increase the probability of success of a treatment program. Also, an important factor is to include members of the community as part of the intervention team whenever possible. The reason for this is that indigenous team members should already be accepted members of the community and therefore should also have established credibility within the community. Given this credibility, they should be able to more easily introduce intervention strategies with greater acceptance on the part of community members.

Prevention

The above strategies are directed at existing diabetic conditions and treatment with the objective of decreasing the reocurrence of diabetic problems. It is important to address primary prevention issues as well. Once an intervention program is in place, it can teach people how to avoid a diabetic condition. This is a secondary gain for nondiabetic family members of a diabetic patient. Family members of special focus for preventative considerations are children. Although not impossible to change, the lifelong habits of adults are well ingrained. Children, on the other hand, are flexible enough to make changes more easily, or to learn a different way of behaving than their parents.

As indicated earlier, Ryan (1981) has reported that the basic social unit for American Indians is the family and that the family as a unit shapes the behavior of individual family members. According to Garbarino (1976), American
Indians had no formal schools for general education of their children. Children were taught all of the basic behaviors of life by the family. Teachers might be parents, older siblings, or other relatives such as grandparents. Garbarino also reported that the education of American Indian children was done by role modeling and direct instruction. Rewards and punishment were also used in educating children in how to behave. This is suggestive of the importance of the utilization of traditional family involvement in educating American Indian children with regard to health-related behaviors.

Hamburg et al. (1982) agree that preventative measures are best directed toward children. However, they also emphasize other sources than parents and immediate family, such as schools, health professionals, community-based organizations, and peer groups. All should be included in a preventative program. Hamburg et al. (1982) have reported that preventative efforts based on community-wide systems appear very hopeful in making an impact. However, they suggest that disease-prevention and health-promotion efforts should not be the sole responsibility of community-based programs. Instead, a collaborative effort with other sources such as schools and health programs should be made.

While Hamburg et al. (1982) discussed preventative issues regarding the general population and did not directly address cultural factors, their proposed strategy would seem useful to the American Indian population if cultural variables were considered. Although the quality of resources may vary, many American Indian communities have at least some access to schools, health professionals, community-based organizations, and peer groups. By coordinating these resources to make a concerted effort, prevention and intervention strategies may have a greater impact on the health of American Indians.

Research Issues

Program Evaluation

Whether considering intervention or prevention issues, it is important to determine and evaluate the effectiveness of a program. One way to address this issue is to determine pre-program incidence and severity of diabetes. Over the course of the intervention/prevention program, drop-out rates should be recorded. It means little to the overall success of the program if one starts with 100 patients and 93 drop out. In the evaluation, programs may benefit from including both process and outcome research strategies: process referring to the ongoing activities throughout the life of a program and outcome referring to comparative changes made between the beginning and the end of a program.
Patients completing the program should be assessed as to whether there are any significant changes in the incidence of diabetes, target behaviors, and related health issues, as well as allowing for patient feedback in regard to the program and staff. Such an assessment should be repeated over time. Patients who do not complete the program should also be assessed whenever possible, including the consideration of the time of dropping out. These assessments can help indicate the immediate and long-term impact of an intervention/prevention program.

**Psychological/Behavioral Research**

As Fisher et al. (1982) and Leon and Roth (1977) have reported, there is a large body of psychological and behavioral research related to diabetes and obesity. However, results are inconsistent. Also, as stated earlier, there is an absolute lack of psychological and behavioral research regarding diabetes among American Indians. Research should cover the spectrum of psychological and behavioral issues from etiology to prevention providing for the inclusion of social and cultural factors. Additionally, with the cultural variability of tribes, these issues should be studied whenever possible within and across tribal groups. As discussed earlier, past research on diabetes among American Indians, especially the Pima tribe, has been primarily physiological and demographic in nature. Future research needs to expand this line of inquiry.

In considering cultural factors that pertain to the diabetic condition among American Indians, there are many areas for study. Of particular importance is the influence of traditional healing practices on prevention and intervention efforts. Given the influence of such traditional factors as the importance of food and eating in social and cultural functions and tribal interests in tradition and traditional stories to explain health issues, further exploration seems merited (Hagey, 1984; Joos, 1984; Judkins, 1978).

Research questions should be explored from a variety of approaches to ensure the most effective impact of programs for American Indian people. Prevention, intervention, and pathological considerations may be explored by assessing the relationship of various variables from both correlational and outcome studies. Comparisons could be made considering age, gender, tribal affiliation, and reservation/urban status. Additionally, cross-cultural comparisons could be made between American Indian and other ethnic groups. The next section outlines one approach to studying the problem.
The Prototypic Study

A prototypic study is proposed to address the role of psychosocial/behavioral factors in the etiology, onset, and perpetuation of diabetes among American Indians. The design presented here is not meant to be the only way of studying these problems, but is a way that may yield considerably important information.

The basic framework would involve a longitudinal study which is also cross-generational. This design avoids the basic problems of a retrospective study and allows for studying experimental issues related to generational membership. The sample should be selected from a reservation-based tribe. However, subjects would be tracked whether they remain on reservation or move to an urban setting. This allows for reservation/urban comparisons which should provide information regarding the thrifty gene hypothesis, especially if foodstuffs have remained relatively traditional on the reservation. A population should be selected in which there are enough subjects to offer a good cross-sampling of generations (e.g., at least 100 per generation). It is important to have a large sample to offset subject mortality, relocation, or refusal to participate. Gender comparisons are also important because of possible gender-related differences.

Once subjects are selected randomly from each generational pool, a series of initial assessments would be administered. First, an extensive psychosocial history (including information on cultural and health beliefs, social mores and support, and personal coping skills) should be conducted. Other relevant personality measures (e.g., anxiety, depression and other emotional component measures, locus of control, etc.) would be utilized, as well as assessments of acculturative stress and other cognitive appraisals of select life events. Behavioral assessments would be made which include health-related activities such as eating (diet and amount eaten) and drinking habits (types and amounts of beverages consumed), exercise, and the circumstances in which these behaviors do and/or do not take place.

Subjects would be evaluated in regard to a family history of diabetes as well as the prevalence of diabetes across generations as determined by the analysis of blood samples. In addition to these assessments each subject would be given a physical exam and a general health history.

Once the assessments and evaluation are completed, an initial analysis of the data would be made. Also, the data can act as a baseline from which to compare each generation with itself at periodic follow-up evaluations in determining factors related to the onset and maintenance of the diabetic condition. Also, generations can be compared at each periodic follow-up and younger generation groups can be compared with older generations at similar ages.
The author recognizes that such a project would be monumental, time consuming, and expensive. However, this health problem is in severe need of study and it is difficult to talk in terms of "price tags" when considering the lives and futures of people. Following a population over time and in terms of cohort differences with regard to the assessment variables outlined earlier should yield important information on the etiology, onset, and perpetuation of diabetes among American Indians. Once such factors can be identified, the efficacy of prevention and intervention strategies could be immensely improved.

Conclusion

American Indian Type II diabetes is a complex problem, as with the general population. Multiple factors contribute to its etiology and maintenance. Heredity and obesity, along with psychological, behavioral, and environmental variables may each be necessary but insufficient conditions for explaining diabetes onset. These factors are in need of further research, especially in regard to psychological and behavioral components. Research should not be limited to etiological and pathological issues, to focus on prevention and intervention strategies as well.

In exploring these areas with regard to diabetes among American Indians, it cannot be overemphasized that cultural sensitivity is a necessary ingredient for conducting relevant research. The proposed intervention and prevention strategies, as well as program evaluation and longitudinal cross-generational studies, are examples of ways in which to approach the problem taking cultural factors into account. It is the author's sincere hope that such strategies will yield new knowledge which will provide for better health care and a healthier way of life for American Indians.

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References


Dr. Ghodes: Being a diabetologist and an internist, it’s been a while since I’ve discussed stress in such models as we’ve talked about this morning. I would like to cover certain general topics, addressing the chapter in *Health and Behavior* (Hamburg, Elliott, & Parron, 1982), and share with you the standpoint of an Indian Health Service diabetologist struggling with an enormous number of patients whose lifestyle changes are complex.

First, the chapter on diabetes in *Health and Behavior* makes a distinction between insulin-dependent diabetes (IDDM) and noninsulin-dependent diabetes (NIDDM), also known as Type I and Type II. The pitfall in this particular classification is that people with NIDDM may be treated with insulin. We need to really understand the terminology, because you’ll see that people are moving away from the juvenile onset to maturity onset terminology. This is enormously important when dealing with the Indian community, because the pattern of NIDDM there is somewhat different from the White community. NIDDM is a disease or condition of older people in the White community. The incidence of diabetes in the Pima Indians peaks between 25 and 55 years and then drops off. The average age of the 46 new patients who presented to the Winnebago Diabetes Project in FY1983 was 39 years. We’re seeing this problem in younger people.

We’re dealing with a growing problem. On the Gila River Reservation alone, between 1967 and 1977, the prevalence of diabetes increased 42%. This is not the only reservation where diabetes is increasing; it’s a reservation where diabetes has been measured very carefully.

We recently published data in the *New England Journal* from a long-term study among the Sackaton. Those results show that the offspring of mothers who had diabetes during pregnancy were heavier at a younger age and developed diabetes at a younger age than the offspring where the mother got diabetes after that particular pregnancy. We postulate that there is something about the metabolic environment of diabetes during the pregnancy that predisposes the child to be overweight at a younger age and thus develop diabetes at a younger age. This represents an enormous challenge and concern. Again, we don’t understand it all, but it’s another reason we are seeing teenagers with NIDDM. A number of us in Indian Health Service are seeing teenagers not with IDDM, but with a family history of diabetes, who are obese as 14- and 15-year-olds.

One of the issues the chapter talks about is coping with diabetes. The coping skills may be somewhat different for IDDM and NIDDM because of the time these diseases come on.
NIDDM has particular implications because the patient with NIDDM in an Indian community is a key to a family with a predisposition for diabetes. When one sees the patient come in with two round children, the concerns are different than with the IDDM patient.

I don’t have to tell a group like this that Indian behaviors have enormous cultural and social significance, and the more we understand about that on a tribal basis, the more we may be able to intervene. For example, the obesity intervention literature is large and discouraging. How much of that applies to us? What are the best techniques to approach obesity in the Indian community? If it’s not even perceived as being a problem, then we health care providers have a double problem.

Where do depression, overweight, and eating fit together, all of which have fundamental ramifications in the treatment and prevention of NIDDM in the Indian community? We’re going to have to refine, or filter, some of the coping literature to see that it applies to our communities.

We have an enormous body of knowledge about NIDDM and how it affects Indians. The world has looked to the Pima Indian study to define diabetes and tell us a great deal about it. In fact, the classification system adopted by the World Health Organization and the National Diabetes Data Group basically has come from the research done in southern Arizona. Yet, we have a real challenge articulating this body of knowledge within the Indian community.

We need to better understand how our patients perceive diabetes, how they perceive body weight, what role eating plays, and what role depression has in this cycle. It’s become apparent in recent years that the bulk of the information available about diabetes is written on a 10th-grade reading level. We need to learn more from the educational psychologists about how to effectively deliver information.

Finally, I think we need to understand more about influencing attitudes, and again we look to the mental health people to help us. In terms of diabetes as a community problem, we need to be dealing with the cultural strengths of our patients, understanding those strengths, and recognizing intertribal variations. In certain communities in which we work, the answer to the question "Do you have diabetes?" is "Not yet." Again, we need your help in the research areas of mental health to help us, as clinicians, deal with this particular problem more effectively.

Dr. Kunitz: One of the things that is striking about both your observations is that NIDDM is a phenomenon of younger people among Indians and, in fact, it seems to occur particularly in the same age group as alcohol use. One wonders if the same kind of oral need, that is, the overeating or the unwise dietary habits that may lead to obesity and perhaps subsequently to diabetes, isn’t the functional equivalent of alcohol use, or alcohol abuse.
Dr. Pine: I don't know if there is an oral aspect.

Dr. Ghodes: The obesity issues go way back into childhood in certain communities.

Dr. Kunitz: But since we know so little about the genesis of alcohol consumption patterns, it seems that one might look to see if they are found more frequently than expected in the same people, or whether alcohol abuse, if it can be measured, varies independently of the prevalence of obesity across tribes.

Dr. Pine: With the reservations where I was working, to be overweight was the norm.

Mr. Whited: Is part of this problem with the early onset of NIDDM perhaps how closely we are looking at this population? Might the prevalence in the White population exist, but remain unidentified until later years when closer monitoring by hospital doctors and staff occurs?

Dr. Ghodes: Well, a number of completed studies don't show this in other communities in the United States, so I think this is not particularly a problem of observation.

Dr. Pine: I mentioned in the paper that a lot of factors are involved, and it's not in terms of a specific population or differences across populations. What strikes me most is when you start looking at socioeconomic factors, ethnicity, at least within the mainstream society, seems to wash out. Regardless of ethnicity, the incidence of obesity among lower income groups is sky high.

Dr. Ghodes: The San Antonio heart study showed that different groups of Spanish Americans who live in San Antonio have different prevalences of diabetes, correlated with their Native American ancestry.

Mr. Whited: Did it also correlate with their per capita income?

Dr. Ghodes: Yes, it did.

Dr. May: It's a complicated issue, and I think what Dorothy pointed out is important. The vast majority of our literature on diabetes in Indians is from Southwest Arizona with the Pima. Different tribes have different experiences in terms of environments which would produce thrifty genes. I think you would find that the epidemiology for the incidence of diabetes would vary based on environment. But what makes it so complicated is that eating norms tend to be extremely tied to many other social activities. In the Southwest, it's a cultural given that you consume more on most special occasions. I think we need a number of studies outside the Southwest and a couple others in the Southwest to look at socioeconomic status, tribal customs, and personality variables of the particular individual to have a good database.
Mr. Whited: The pattern in the Northwest is one of relative abundance, and if you wanted to compare several populations you could take the desert population, which did live hand-to-mouth, and the Northwest population, which had an abundant food supply most of the year, and compare the incidence of diabetes between those two populations. That might speak to the thrifty gene idea.

Dr. Levy: You could also do some direct observations of how children were reared in eating patterns. I don’t know about the Northwest, but certainly in the hunting and gathering tribes and in most of the tribes in the Southwest, you have traditional early conditioning: "When there’s food, eat it; when it’s not there, keep your mouth shut, because there’s nothing we can do about it." With the reservation, diet and activity change, but the conditioning for the eating pattern doesn’t. You move to white flour and sugar, bacon, and animal fats: an enormous diet shift and a more sedentary life. Now you move to today with the cash economy, and you go to a package store and take the preferred foods. At least with Navajo kids that I know, the training pattern for eating is still, "If the food is there, eat it; if it’s not there, shut up." But it’s hardly ever not there. I think looking at Northwest coastal groups would be an interesting comparison.

Dr. Guilmet: Is there any data in Indian Health Service on the changes in weight for kids?

Dr. Pine: In fact, there is some data from the 1950s through the mid-1970s. I haven’t seen anything since then, but there seems to be, for other tribes as well, a big shift occurring very recently in terms of types of diets, going from high protein to high carbohydrates. In conjunction with that, we started seeing an increase in weight, blood pressure, and heart disease.

Dr. Guilmet: The same thing occurred when I worked among the Eskimo in the Yukon area. It was amazing that the only imported foods became high-prestige items: canned fruits, Coca-Cola and 7-Up, and canned chickens. Not what we would consider to be preferred foods.

Dr. Ghodes: One of the most startling things that’s come out of the Pima study is the comparison of the weight of young people between 1967 and 1977. To give you an example, the average 15- to 20-year-old male weight was 75.6 kilos in 1967, and in 1977 the average weight was 9.24 kilos heavier—over 18 pounds heavier. That is highly significant.

Mr. Whited: Did they get taller too?

Dr. Ghodes: They also look at the change in the body mass index, which controls for that. The body mass index was 26.09 in 1967, the BMI went up 2.57 by 1977—again, highly significant. So, indeed there is measurement of young people getting heavier, at least in one reservation community.

Dr. Mohatt: Did your data say that there is a higher incidence among females than males?
Dr. Pine: Well, the clinical observations at the reservations I was dealing with suggest a higher incidence among women, but it’s a matter of who is coming to the attention of whom.

Dr. Mohatt: One of the reasons I ask in terms of contributing cause is that I was always struck in my years with the Sioux, that in terms of mate preference, the men really preferred fatter women. They did not like skinny women, and in fact encouraged their wives to stay what I would call overweight. Not having any of the anthropological background to know whether that was traditionally an ideal for a woman, I don’t know if it comes from a historical pattern.

Dr. Pine: There could be some historical aspects to it. An anthropological article appeared several years ago and I can’t remember which specific tribe it dealt with, although it’s likely to have been the Pima. It was in the Southwest, and they found that particularly with the heavier women, the higher the blood sugar level, up to a point, the more fertile the woman was.

Dr. Trimble: There is a wealth of data on the Indian boarding school system going way back, because they took heights and weights.

Dr. Dinges: I heard both Dr. Pine and Dr. Ghodes comment on emotional stress and diabetes onset, and depression and psychopathology in relation to diabetes. Can you elaborate on these relationships?

Dr. Pine: It’s one of those areas that has a lot of mixed results from various studies. There is a stress factor in that various biochemical indices seem to increase with added stresses or with mental disorders, and that these eventually develop into diabetes conditions. Again, the direct relationship is vague and needs exploration. They haven’t been able to pin it down in any kind of a systematic way that I’ve seen.

Dr. Ghodes: I think one intriguing thing about the Pima study is the longitudinal weight history of patients prior to the onset of diabetes. Examining these people at 2-year intervals, what happens is that the people go along gaining weight gradually, then seem to gain 20 pounds, at which point they decompensate and get diabetes. One of the questions one could ask is, "Is that 20-pound weight gain stress related?"

Mr. Whited: Or is it a metabolic disorder that causes the onset of the weight and then also creates the depression?

Dr. Ghodes: We’re going to understand the metabolic question a whole lot more because there is a 5-year study underway, looking at the onset of diabetes with a lot of biochemical parameters. These people’s glucose tolerance tests come at 2-year intervals with these weights, so they haven’t decompensated and have diabetes at the time of the weight spurt.

Dr. Manson: Given what seems to be a very intriguing notion that there might be stress factors related to this, are there measures of stress and related types of phenomenon in these kinds of studies?
Dr. Ghodes: No.
Dr. Manson: Why not?
Dr. Ghodes: Well, this is an NIH study. This is not a study we in Indian Health Service have done.
Dr. Manson: I just wanted to have my suspicions confirmed.
Dr. Ghodes: I understand your issues and concern, and I think that this is perhaps something that can be discussed within NIMH.
Dr. Manson: When we’re talking about cost-effectiveness and research opportunities, it seems bordering on the criminal not to include informed focus on some of these issues in ongoing studies. I have tried to follow as much as possible the literature coming out of the Southwestern studies on diabetes, and I have yet to see anything at all on the psychosocial dimensions to diabetes.
Dr. Dinges: Let’s have a concluding comment from Gordon Neligh.
Dr. Neligh: In the area of neuroendocrine excess that is associated with the major affective disorders, most of the endocrine parameters are those most commonly associated with aberrations of glucose metabolism except for insulin. The dexamethasone suppression test in a sample of Indian patients was highly abnormal. They didn’t suppress as appropriate for patients with a major depressive illness, and epinephrine was disordered, as were the thyroid functions. I’m not aware of anyone looking at the relationship between major depression and the onset of diabetes or looking at those multiple endocrine axioms together. That would be very fertile ground for research with Indian populations.