Special Diabetes Program for Indians: Retention in Cardiovascular Risk Reduction

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Purpose: This study examined the associations between participant and site characteristics and retention in a multisite cardiovascular disease risk reduction project. Design and Methods: Data were derived from the Special Diabetes Program for Indians Healthy Heart Demonstration Project, an intervention to reduce cardiovascular risk among American Indians and Alaska Natives with diabetes. In 2006, a total of 1,072 participants from 30 participating sites completed baseline questionnaires measuring demographics and sociobehavioral factors. They also underwent a medical examination at baseline and were reassessed annually after baseline. A Provider Annual Questionnaire was administered to staff members of each grantee site at the end of each year to assess site characteristics. Generalized estimating equation models were used to evaluate the relationships between participant and site characteristics and retention 1 year after baseline. Results: Among enrolled participants, 792 (74%) completed their first annual assessment. Participants who completed the first annual assessment tended to be older and had, at baseline, higher body mass index and higher level of physical activity. Site characteristics associated with retention included average age of staff, proportion of female staff members, and percentage of staff members having completed graduate or professional school. Implications: Understanding successful retention must reach beyond individual characteristics of participants to include features of the settings that house the interventions.

Key Words: Diabetes, Cardiovascular risk prevention, Case management, Participant retention, American Indians

The recruitment of individuals into intervention trials has garnered increasing attention as it has become clear that a number of factors, such as gender, age, race/ethnicity, and disease status, systematically as well as differentially affect individual decisions to participate in these efforts (Blanton et al., 2006; D. M. Brown et al., 2006; Coday et al., 2005). There is mounting evidence that biases of this nature compromise representativeness, estimates of effects or rates, and generalizability of results, thereby undermining the
confidence one can place in the preventative or treatment approaches under study (Lachin & Foulkes, 1986; Matts, Launer, Nelson, Miller, & Dain, 1998). In response, March 1994, the National Institutes of Health introduced a specific policy mandating the recruitment of racial/ethnic minorities and women into publicly funded clinical research (http://grants.nih.gov/grants/funding/women_min/guidelines_update.htm; Hohmann & Parron, 1996). Although this attention to recruitment was long overdue, much less consideration has been given to the consequences of the differential retention of participants once engaged in a study or trial.

Retention is just as important as recruitment to the conclusions one may draw from intervention trials. Like recruitment, retention also affects statistical power, bias, and generalizability (Robinson, Dennison, Wayman, Pronovost, & Needham, 2007). Low retention rates affect the power to detect differences in outcomes (Lachin & Foulkes, 1986). Differential retention of subgroups—defined, for example, in terms of gender, age, or race/ethnicity—compromises comparison, especially if subgroup membership is related to the outcome of interest (Good & Schuler, 1997). Generalizability of results is diminished to the extent that the characteristics of those who dropped out of an intervention study are different from those who were retained (Curry & Jackson, 2003).

A wide range of factors appears to affect whether or not an individual remains in a trial. There is, for example, ample documentation that men are more likely than women to be lost to follow-up (Bailey, Bieniasz, Kmak, Brenner, & Ruffin, 2004; D. R. Brown, Fouad, Basen-Engquist, & Tortolero-Luna, 2000; Hessol et al., 2001; Neill & Chessa, 1998; Shumaker, Dugan, & Bowen, 2000); that older adults—barring functional impairments and issues of access—are likely to participate more fully than younger adults (Anderson, Ory, Cohen, & McBride, 2000; Cassidy, Baird, & Sheikh, 2001; Thornquist, Patrick, & Omenn, 1991); that individuals of higher rather than lower socioeconomic status are more likely to be retained (Warren-Findlow, Prohaska, & Freedman, 2003); that African Americans as well as American Indians are at greater risk of dropout than Whites or Asian Americans (Blumenthal, Sung, Coates, Williams, & Liff, 1995; D. R. Brown & Topcu, 2003; Dilworth-Anderson & Williams, 2004; Gorelick, Harris, Burnett, & Bonecutter, 1998; Noe et al., 2007; Shavers, Lynch, & Burmeister, 2002); that depression, anxiety, and alcohol involvement shorten exposure (Chang, Brown, & Nitzke, 2009; Gappoo et al., 2009; Hessol et al., 2001; Katon et al., 2004; Villcorta et al., 2007; Williams, Powers, Yun, & Foa, 2010); and that being single with multiple children contributes to limited availability and infrequent attendance (Gappoo et al., 2009). With respect to staff/provider characteristics, it has been shown that women generally are more effective than men in retaining participants of both sexes (Tansey, Matte, Needham, & Herridge, 2007); that older staff—to the extent that they are seen as mature, experienced, and respected—are more successful than their younger counterparts in sustaining involvement (Blanton et al., 2006; Blumenthal et al., 1995); that staff training, expertise, and professional education correlate highly with decisions to remain in a trial (Booth, Corsi, & Mikulich-Gilbertson, 2004; D. M. Brown et al., 2006); and that interpersonal skills such as personalized attention, empathy, and support result in higher rates of completion (Cassidy et al., 2001). Various features of the site at which an intervention is mounted also are known to relate to adherence. Well-described examples include settings that are welcoming, nonstigmatizing, able to ensure privacy, easily accessible, and located near relevant resources (Gappoo et al., 2009; Warren-Findlow et al., 2003; Williams et al., 2008).

Turning to retention strategies, Robinson and colleagues (2007) meta-analysis of the relevant literature identified 12 basic themes, including community involvement, study identity, reminders, contact and scheduling methods, and financial incentives. No optimal strategy emerged; rather, successful retention was associated with a combination of multiple strategies. Their review found that programs with higher retention rates adopted an average of 21 different strategies cutting across several themes.

Yet, in reality, these observations are not as consistent as this brief review may suggest. The truer picture likely reflects a complicated interaction of participant, provider/staff, study/program, and site characteristics as well as retention strategies. For example, the personal salience of the health condition at issue (Noe et al., 2007), and ethnic match of participant and staff (Parra-Medina et al., 2004; Shavers et al., 2002), as well as participants’ previous research or intervention experiences (Marcellus, 2004; Mazzuca et al., 2004) have been strongly associated with the quality and duration of engagement in intervention trials.
We sought to advance this line of inquiry by examining the relative contribution of participant, staff/provider, and site characteristics to retention in a nationwide intervention aimed at reducing the risk of cardiovascular disease (CVD) in American Indians and Alaska Natives (AI/ANs) with diabetes. The Special Diabetes Program for Indians Healthy Heart (SDPI-HH) Demonstration Project employed an intensive case-management approach to promote the Indian Health Service’s (IHS) existing standards of care, which are generally recognized as state of the art in our country’s public health system. SDPI-HH was subjected to a rigorous, multilevel evaluation that chronicled participant outcomes over time and provided the data to address the questions before us.

**Research Design and Methods**

**SDPI-HH Demonstration Project**

In recognition of the large disparities in diabetes and its complications among AI/ANs (Burrows, Geiss, Engelgau, & Acton, 2000; Howard et al., 1999), in 2002, the U.S. Congress directed the IHS to develop a competitive grant program to support demonstration projects implementing evidence-based diabetes and CVD prevention activities and to evaluate the effectiveness of these activities among AI/AN communities. SDPI-HH is one of the two projects funded and is designed to reduce cardiovascular risk among AI/ANs with diabetes through an intensive case-management program.

In 2004, 30 health care programs received funding to participate in SDPI-HH. Grantees represent a diverse mix of programs, serving 138 tribes in 13 states and each of the 12 IHS administrative areas. These programs include 7 IHS hospitals/clinics and 23 tribal health care programs or urban IHS-contracted programs.

Participating programs implement a case-management intervention designed to improve CVD risk factors. At baseline and annually for up to 3 years, participants undergo a medical examination, during which CVD risk is assessed and an individualized care plan is developed or refined. After completing the baseline assessment, participants attend individual case-management meetings at which progress toward CVD risk reduction is evaluated. During these visits and through structured group activities, participants receive education on diabetes self-management and CVD risk reduction.

**Participants**

Participants were required to be AI/AN, to be 18 years or older, and to have diabetes. Individuals were excluded if they were pregnant, receiving dialysis for end-stage renal disease, undergoing cancer treatment, having active alcohol/substance abuse problems, or having any other condition that would affect successful participation based on a provider’s judgment. When authorized by their local institutional review boards (IRBs) or the National IHS IRB (for sites with no local review board), participating grant programs identified individuals with diabetes in local communities mainly through electronic medical records or local diabetes registries. Some grant programs also recruited participants through community events (e.g., diabetes screening and health fairs) and clinic-based activities (e.g., advertisements in local clinics and provider referrals). Enrollment began in January 2006 and is ongoing. However, in consideration of fiscal and workload issues, an abbreviated participant questionnaire, which does not include all of the items needed for this work, was implemented in August 2009. Of those who were identified to be eligible, 1,440 participants were recruited and consented in the first year of enrollment. The present analyses involved the 1,072 participants who completed the baseline questionnaire and started case management visit in year 2006.

When a participant was not compliant with attending case-management visits or completing assessments, grant programs were instructed to continue retention efforts unless the participant requested otherwise. Retention forms were completed on each participant describing the nature and extent of retention efforts and, if the participant dropped out of the intervention, the reason for dropout. Retention forms were submitted to the Coordinating Center either when a participant formally dropped out of the program or annually in January for all participants.

The protocol was approved by the IRB of the University of Colorado Denver and by the National IHS IRB. When required, grantees obtained approval from other entities charged with overseeing research in their programs (e.g., tribal review boards, tribal council, and regional IHS IRB). All participants provided written informed consent and Health Insurance Portability and Accountability Act authorization. SDPI-HH grantees reviewed and approved this article in advance of publication.
Measures

At baseline and annually for up to 3 years, participants underwent a medical examination, during which CVD incidence and risk were assessed. Additionally, at each assessment, participants completed a questionnaire that included questions regarding sociodemographics, health-related knowledge, attitude, and behaviors, as well as comorbidities. In this study, completion of the first annual medical examination was deemed as successful first-year retention and was used as the dependent variable for all analyses. Those who did not complete the first-year medical examination due to death or becoming pregnant (n = 9) were excluded from the analyses. We examined the association between retention and the following site- and participant-level characteristics.

Site Characteristics.—Site-specific factors included type of grant program administration (IHS hospital or clinic vs. tribal health care program), the user population of the health facility of each grantee site (small [less than 5,000 users], medium [5,000–9,999], and large [10,000+]), and the number of participants accrued at each site (<20, 20–39, and 40+). The characteristics of staff members of each grantee site were obtained from Provider Annual Questionnaires completed by grantee staff members in December 2006. In this study, we examined the relationship between retention and average age of the staff members (<42, 42–47, and 48+ years), percent of female staff members (<60%, 60–79%, and 80+%), and percent of staff members who completed graduate/professional school (<50%, 50–74%, and 75+%). The cutoff values of each staff characteristic were chosen so that the grantee sites were divided into three groups, where the grantee sites in the lowest quartile and the highest quartile were compared with those in the middle half.

Participant Characteristics.—Sociodemographics. Participants answered a limited number of questions related to their sociodemographic characteristics, including age, gender, educational attainment, employment status, marital status, and annual household income.

Clinical Indicators. Baseline physical examination included measurements of height, weight, and sitting systolic blood pressure (SBP) and diastolic blood pressure (DBP). Body mass index (BMI) was calculated from height and weight (kg/m²). Blood pressure was dichotomized into a binary variable: normal (SBP ≤ 130 mm Hg and DBP ≤ 80 mm Hg) and high blood pressure (SBP > 130 mm Hg or DBP > 80 mm Hg). Blood was drawn after a 12-hr fast to measure triglycerides, high-density lipoprotein (HDL) cholesterol, low-density lipoprotein cholesterol, and hemoglobin A1c (HbA1c). In addition, self-report number of comorbid conditions was assessed with the Self-Administered Comorbidity Questionnaire (Sangha, Stucki, Liang, Fossel, & Katz, 2003).

Sociobehavioral factors. Participants were queried about a wide range of sociobehavioral factors that may be related to reducing CVD risk. These included smoking status, stages of change, family support, psychological distress, physical activity, pain, and health literacy/numeracy.

1. Smoking status: History and current status of cigarette smoking were collected using items from the American Indian Service Utilization, Psychiatric Epidemiology, Risk and Protective Factors Project (Nez Henderson, Jacobsen, Beals, & AI-SUPERFPP Team, 2005).

2. Stages of change: The transtheoretical model posits that behavior change is more likely among those who have actively contemplated and prepared for such change (Marcus, Banspach, et al., 1992; Marcus, Selby, Ni aura, & Rossi, 1992; Velicer, Fava, et al., 1995; Velicer, Hughes, Fava, Prochaska, & DiClemente, 1995) and may be associated with participants’ willingness to stay in the project. Five stages of change are proposed: (a) precontemplation (no intention of changing behavior), (b) contemplation (intend to change in distant future), (c) preparation (intend to change in the near future), (d) Action (actively engaged in new behavior), and (e) maintenance (have engaged in the behavior for some time, such as 6 months or more; Prochaska, Johnson, & Lee, 1998). As part of the participant questionnaire, stage of change was captured for both reducing dietary fat intake and engaging in regular exercise each week (Parker, Baker, Williams, & Nurss, 1995). In this study, we dichotomized both of these variables into two categories: pre-action (including precontemplation, contemplation, and preparation stages), and action (including action and maintenance stages).

3. Family support: The availability of a family support person was determined by having a family member complete a brief family questionnaire at baseline.
4. Distress: The Kessler Distress Scale (Furukawa, Kessler, Slade, & Andrews, 2003; Kessler et al., 2003) is a general measure of psychological distress often used to screen for serious emotional problems and previously has been shown to be related to retention (Chang et al., 2009; Katzer et al., 2008; Yass-Reed, Barry, & Dacey, 1993); SDPI-HH used the six-item version (K6; \( \alpha = 0.88 \)).

5. Physical activity: Rapid Assessment of Physical Activity (Topolski et al., 2006), a short, self-administered instrument assessing weekly physical activity, was included in the baseline questionnaire. It is a nine-item instrument with response options of “yes” or “no” to questions covering a range of physical activity levels from “sedentary” to “regular active,” as well as strength training and flexibility. The total score of the first seven items measures aerobic physical activities and is categorized into one of five levels of physical activity: “1 = sedentary, 2 = underactive, 3 = regular underactive (light activities), 4 = regular underactive, and 5 = regular active.”

6. Pain: A visual analog pain scale (range 1–10) was used to assess each participant’s feeling of general pain at each visit (Carlsson, 1983; Jerome & Gross, 1991).

7. Health literacy/numeracy: Print literacy items assessed self-reported confidence in reading or completing medical forms and were adapted from the health literacy screening questions developed by Chew, Bradley, and Boyko (2004). Overall performance on the print literacy items was measured as the mean of a participant’s responses to the three items (possible range of 1–5, with larger values indicating greater print literacy). The numeracy items were adapted from two sources to assess comprehension of proportions and percentages, the ability to identify the appropriate timing of a second dose of medication, and to determine whether a given blood glucose value is in the normal range (Lipkus, Samsa, & Rimer, 2001; Parker et al., 1995). In this study, overall numerical performance was measured as the percentage of items answered correctly.

Data Analysis

Successful first-year retention was used as a dichotomous variable in all the data analyses. Bivariate associations between retention and site characteristics and categorical participant-level factors were examined using \( \chi^2 \) tests. Bivariate associations between retention and continuous participant-level variables were evaluated using two sample \( t \)-tests. Factors with \( p \) values of <.25 in the bivariate analyses were entered into multivariate models in a block-wise manner. More specifically, all the participant-level sociodemographic factors with \( p \) values <.25 in the bivariate analyses were entered into the multivariate model first, which was then reduced by deleting the variables with \( p \) values >.2 at that step. We then entered all participant clinical indicators with bivariate \( p \) values <.25 into the previous model, and reduced that model by excluding the variables with \( p \) values >.2 at that time. Similar steps were performed for the sociobehavioral factors and site-level characteristics until we reached a final model. To account for within-site clustering, generalized estimation equation (GEE) models with a logit link and an exchangeable correlation matrix were utilized for all multivariate regression models. All data analyses were conducted using SAS 9.2 software (SAS Institute, 2008).

Missing data were uncommon for most of the site- and participant-level factors (<10%) except income and marital status (20% and 18%, respectively). However, the \( p \) values for bivariate analyses between retention and these two variables were greater than .25 and, hence, were not included in the final multivariate model. Furthermore, the insignificant associations did not change when we performed the bivariate analyses using data with multiply imputed sociodemographic variables. The multiple imputations were performed using IVEware developed by the University of Michigan Survey Methodology Center (Raghunathan, Solenberger, & Hoewyk, 2009). Because the results based on data with and without imputation were similar, and the final model without imputation lost few observations (\( n = 49 \), only 4.6% of the total sample), we report the results from data analysis without imputation in the following section.

Results

As of December 2006, 1,072 participants had enrolled in SDPI-HH and completed baseline participant questionnaires. Seventy-four percent (792 of 1,072) of these participants completed their first annual medical examination. Participants who were not retained because of death (\( n = 7 \)) or becoming pregnant (\( n = 2 \)) were excluded from subsequent analyses. Many grant programs struggled with
scheduling the first annual medical examinations, which were to be obtained 12–13 months after the participant started case management. On average, the first annual assessments were obtained 12.7 months (range, 6.4–21.8 months) after initiating case management. The mean number of case-management visits attended by the participants in the first year of SDPI-HH was 9 (range, 1–15) for the participants who completed the first annual assessment.

The total column of Table 1 describes the sample characteristics of SDPI-HH participants enrolled in year 2006. The majority of participants were women (69.4%) and were married or living in a “marriage-like” relationship (59.9%). The average age of the participants was 55.4 years old with a standard deviation of 11.4. About half of the participants had attended some years of college, and 16.2% of the participants had graduated from college. Twenty percent of SDPI-HH first-year participants were retired, whereas 25.9% were unemployed or still going to school.

Table 1 also compares baseline participant characteristics of those who completed their first annual assessment with those who did not complete their first annual assessment. Participants with a year-one assessment were significantly older (55.9 vs. 53.8 years, p = .0113) and had, at baseline, marginally lower HbA1c levels (7.5% vs. 7.8%, p = .0600), significantly higher BMI (36.9 vs. 35.8, p = .0416), and significantly higher HDL levels (44.2 vs. 42.1 mg/dl, p = .0122). They also were less likely to have high blood pressure and were less likely to be current smokers at baseline than those who did not finish their first annual medical examination.

Retention rates by different site-specific characteristics are shown in Table 2. Medium-sized sites in terms of user population (5,000–10,000 patients) had significantly higher retention rates than small or large-sized grantee sites (78.7% vs. 74.8% and 71.1%, respectively, p = .0418). Further, the sites that recruited 40 or more participants in year 2006 had significantly higher retention rates than the sites that recruited fewer participants in the same year (p = .0305). Regarding the characteristics of staff members in each grantee site, those sites with an average staff member age between 42 and 47 years exhibited significantly lower retention rates than did other sites (p = .0002). Sites with more than 80% female staff members had marginally lower retention rates than did sites with fewer female staff (p = .0697). Finally, the retention rates of sites at which more staff members had completed graduate or professional schools were significantly higher than those of sites with less-educated staff (p < .0001).

The final multivariate GEE model for year-one retention success incorporating both participant- and site-level variables is presented in Table 3. In the final model, baseline age was strongly associated with the odds of successful retention 1 year after baseline with an odds ratio of 1.26 for every 10 years of increase in age. In addition, participants with larger BMI and higher level of physical activity at baseline were significantly more likely to complete the first annual medical examination (OR = 1.02, p = .018; OR = 1.17, p = .0316, respectively). In terms of site characteristics, the average age of staff, proportion of female staff members, and proportion of staff completing graduate or professional school were marginally associated with retention. More specifically, sites with an average staff member age between 42 and 47 years were marginally less likely to have participants complete the first annual assessment than sites with an average staff member age of 48 years or greater (OR = 0.56, p = .067). Further, sites with 60–80% female staff were significantly more likely to retain participants one year after baseline than sites with 80% or more female staff (OR = 1.99, p = .045). Finally, sites where 75% or more staff members had completed graduate or professional school had significantly higher odds of retention success than did sites where less than 50% of staff members had finished graduate or professional school (OR = 3.12, p = .052).

Discussion

The most startling finding of this study is the minimal role that participant characteristics played in predicting retention. This is especially true with respect to the results of the bivariate analyses, which tend to overestimate the importance of individual factors independent of the possibly simultaneous contribution of others. Among sociodemographic features, only participant age, specifically being older, was associated with remaining in the program. Age likely operated here as a marker of perceived risk and relevance of participation to longer-term well-being (Anderson et al., 2000; Arean, Alvidrez, Nery, Estes, & Linkins, 2003). However, many other sociodemographic factors widely assumed to influence retention simply did not: gender, educational level, marital status, and
income were prominent by virtue of their absent effect. As indices of tangible resources that can facilitate an individual’s investment of time and effort in interventions of this nature, their lack of importance here is particularly striking.

Nor did commonly noteworthy sociobehavioral factors predict retention in SDPI-HH. Participant status in regard to readiness to change diet or extent of exercise, health literacy and numeracy, psychological distress, and pain, as well as availability of...
family support, bore no relationship to whether or not participants continued in the intervention at the close of the year. These factors relate to individual motivation to change, to assimilating knowledge specific to desired health outcomes, to cognitively reframing and acquiring skills to change related behavior, to coping with the physical demands of such change, and to encouraging as well as routinizing subsequent gains (Conwell et al., 2007; Davis, Broome, & Cox, 2002; De Bruyn, Hudgens, Sullivan, & Duerr, 2005). All have surfaced to varying degrees in the literature as being linked to retention, but not here. At the bivariate level, only being a current smoker upon entry into the

Table 2. SDPI-HH Retention Rates by Site Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>No. of sites</th>
<th>No. of participants</th>
<th>% Completed Year 1 annual assessment</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organization type</strong></td>
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<tr>
<td>IHS</td>
<td>7</td>
<td>243</td>
<td>77.4</td>
<td>.2441</td>
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<tr>
<td>Tribal</td>
<td>23</td>
<td>820</td>
<td>73.7</td>
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<tr>
<td><strong>User population size</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>8</td>
<td>218</td>
<td>74.8</td>
<td>.0418</td>
</tr>
<tr>
<td>Medium</td>
<td>9</td>
<td>367</td>
<td>78.7</td>
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<tr>
<td>Large</td>
<td>13</td>
<td>478</td>
<td>71.1</td>
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<tr>
<td><strong>Total accrual number in 2006</strong></td>
<td></td>
<td></td>
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<tr>
<td>&lt;20</td>
<td>7</td>
<td>104</td>
<td>70.2</td>
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<td>20–39</td>
<td>12</td>
<td>372</td>
<td>70.7</td>
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<tr>
<td>40+</td>
<td>11</td>
<td>587</td>
<td>77.7</td>
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<tr>
<td><strong>Average age (years) of staff members</strong></td>
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<td></td>
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<tr>
<td>&lt;42</td>
<td>8</td>
<td>299</td>
<td>78.3</td>
<td>.0002</td>
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<td>42–47</td>
<td>15</td>
<td>532</td>
<td>69.2</td>
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<td>48+</td>
<td>7</td>
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<td><strong>Proportion of female staff</strong></td>
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<td></td>
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<tr>
<td>&lt;60%</td>
<td>8</td>
<td>312</td>
<td>77.9</td>
<td>.0697</td>
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<tr>
<td>60%–79%</td>
<td>13</td>
<td>419</td>
<td>75.4</td>
<td></td>
</tr>
<tr>
<td>80%+</td>
<td>9</td>
<td>332</td>
<td>70.2</td>
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<tr>
<td><strong>Proportion of staff completing graduate/professional school</strong></td>
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<tr>
<td>&lt;50%</td>
<td>6</td>
<td>206</td>
<td>57.3</td>
<td>&lt;.0001</td>
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<tr>
<td>50%–74%</td>
<td>17</td>
<td>611</td>
<td>76.9</td>
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<tr>
<td>75%+</td>
<td>7</td>
<td>246</td>
<td>82.9</td>
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</tr>
</tbody>
</table>

*Notes: SDPI-HH = Special Diabetes Program for Indians Healthy Heart; IHS = Indian Health Service.*

Table 3. Final Generalized Estimation Equation Model for First-Year Retention Success

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Odds ratio</th>
<th>95% confidence limits</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participant level</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Age (10 years)</td>
<td>1.26</td>
<td>1.10</td>
<td>1.43</td>
</tr>
<tr>
<td>BMI</td>
<td>1.02</td>
<td>1.00</td>
<td>1.05</td>
</tr>
<tr>
<td>Rapid Assessment of Physical Activity (aerobic)</td>
<td>1.17</td>
<td>1.01</td>
<td>1.35</td>
</tr>
<tr>
<td>High blood pressure</td>
<td>0.86</td>
<td>0.70</td>
<td>1.06</td>
</tr>
<tr>
<td><strong>Site level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average age (years) of staff members</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;42</td>
<td>1.18</td>
<td>0.46</td>
<td>3.03</td>
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<tr>
<td>42 to &lt;47</td>
<td>0.56</td>
<td>0.30</td>
<td>1.04</td>
</tr>
<tr>
<td>48+ (reference)</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of female staff</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;60%</td>
<td>1.06</td>
<td>0.47</td>
<td>2.41</td>
</tr>
<tr>
<td>60%–79%</td>
<td>1.99</td>
<td>1.02</td>
<td>3.91</td>
</tr>
<tr>
<td>80%+ (reference)</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of staff completing graduate/professional school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;50% (reference)</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50%–74%</td>
<td>2.19</td>
<td>0.87</td>
<td>5.50</td>
</tr>
<tr>
<td>75%+</td>
<td>3.12</td>
<td>0.99</td>
<td>9.81</td>
</tr>
</tbody>
</table>

*Notes: BMI = body mass index.*
program proved to be strongly associated with later leaving it—at first glance, a logical observation for an intervention focused on cardiovascular risk reduction and the challenge of smoking cessation.

Of the relevant clinical indicators, higher BMI at baseline was related to successful retention in both bivariate and multivariate analyses. The need to improve—and the desirability of improving—one’s status with respect to these indicators clearly is consistent with the goals of this intervention. Hence, its emergence in distinguishing between participants retained and participants lost to follow-up was not surprising. In the same vein, however, it was unexpected that other comorbid physical health problems, several of which are often the subject of CVD prevention, did not correlate with retention (Dudley et al., 1995; Froelicher et al., 2003).

In sharp contrast, the bivariate analyses repeatedly underscored the contribution of site-specific characteristics to retention. Sites successfully retaining their participants served medium-sized user populations; accrued large numbers of participants; and were characterized by a mix of younger and older staff, a balance of male and female providers, and higher levels of professional preparation. These attributes speak to issues of access, to optimal availability of resources (e.g., time, equipment, expertise, and services), to program presence, to varied experience, and to creditability as well as to authority (Good & Schuler, 1997; Morse, Simon, Besch, & Walker, 1995; Newberry et al., 2010; Orr, Blackhurst, & Hawkins, 1992; Williams et al., 2008).

Subsequent multivariate modeling sharpened our initial findings. With respect to participant characteristics, increasing age and higher BMI remained strong predictors of retention, unexpectedly joined by higher levels of physical activity at baseline, which previously had not been suggested. Smoking status, HDL level, and high blood pressure faded in importance. The contribution of several site characteristics was attenuated, notably user population size and number of intervention participants. Staff age, gender, and professional training remained important to retention, although not as robustly as before.

Several limitations to this study may have constrained our ability to identify other elements critical to retention. First, we did not directly measure transportation as a possible barrier. The intensive case-management activities emanated from largely community-based clinics, the long-standing seat of most medical care offered in AI/AN communities. Participants can live at substantial distance from such sites, thereby compromising their ability to keep scheduled appointments. However, lack of transportation is not likely to explain dropout more than a year-long intervention. Other measures of instrumental resources—for example, income, marital status, and family support—were unrelated to continued participation. In addition, staff went to great lengths to schedule alternate appointments to accommodate the exigencies of life in these communities. For example, telephone follow-up and even home visits frequently were used to maintain contact and to retain patient involvement. This latter point introduces the second limitation of the present study. Namely, we did not consider here the specific retention strategies that program staff used to engage participants. As noted previously, the evaluation systematically gathered this information, but we have not yet had the opportunity to assemble, categorize, and quantify such activities. Clearly, outreach and engagement efforts of the type just mentioned can affect retention. Grantees proved remarkably creative in developing a wide range of incentives as well as events to sustain interest in the program. Indeed, it may be that these retention strategies are linked to the site characteristics that predicted retention. Moreover, the power of such strategies may explain why the individual characteristics of participants contributed so little to identifying the forces at work in sustaining their involvement. We intend to examine these possibilities in future reports. Finally, SDPI-HH is comprised of 30 grantee sites, which may have limited statistical power in identifying significant relationships between site characteristics and retention. This may partially explain why several significant effects of site characteristics to retention in bivariate analysis disappeared in the multivariate GEE model when we took the multilevel data nature of SDPI-HH into consideration.

These findings suggest that we may have a tendency to overemphasize the contribution of participant attributes and dispositions to retention in preventative and treatment trials. Although they are undoubtedly important, recognizing the important role of other factors, notably environmental ones, promises to lead us away from “blaming the victim,” as is too frequently the case, especially when examining such matters among women, older adults, and racial/ethnic minorities. In addition to recruitment activities, our future work in this regard will consider how staff turnover, organizational...
culture, agency status (e.g., private, tribal, or federal), and rurality may contribute to successfully retaining participants in this large-scale intervention. The present findings argue that, despite individual predilections to the contrary (even if determined to be true), we can alter process and setting to promote engagement through supports and rewards. This is good news. We need to more aggressively pursue this line of inquiry and, as importantly, discover how to translate the resulting knowledge into everyday practice.

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References


Appendix

Absentee Shawnee Tribe of Oklahoma; Albuquerque Service Unit; Bad River Band of Lake Superior Chippewa; Blackfeet Tribe; Choctaw Nation of Oklahoma; Alabama and Kootenai Tribes; Montana/Wyoming Tribal Consortium with Assiniboine and Gros-Ventre, Chipewa Creek Tribe, Crow Nation; Hualapai Tribe; Indian Health Care Resource Center of Tulsa, Inc., in consortium with Northeastern Tribal Health System Miami Service Unit; Indian Health Council, Inc.; Leech Lake Reservation Tribal Council; Mille Lacs Band of Ojibwe in consortium with St. Croix Chippewa Indians of Wisconsin; Muscogee
Creek Nation Health System; Navajo Area Indian Health Service with Northern Navajo Medical Center and Inscription House Clinic; Northwest Washington Indian Health Board with Lummi Indian Nation, Nooksack Tribe of Indians, Swinomish Tribal Community, and Upper Skagit Indian Tribe; Ramah Navajo School Board, Inc.; Redding Rancheria Indian Health Clinic; Hoopa Valley Tribe; Riverside-San Bernardino County Indian Health, Inc.; Santo Domingo Tribe; Sault Ste Marie Tribe Chippewa; Seattle Indian Health Board; St. Regis Mohawk Health Services; Taos-Picuris Service Unit; Tohono O’Odham Healthy Heart Demonstration Project; Toiyabe Indian Health Project, Inc.; Uintah and Ouray IHS Clinic; Wagner Health Care Center IHS; Whiteriver IHS Service Unit; Yakama Indian Health Center-IHS/DHHS; Yukon-Kuskokwim Health Corporation.