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Patterns of Protective Factors in an Intervention for the Prevention of Suicide and Alcohol Abuse with Yup'ik Alaska Native Youth

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Abstract

Community-based participatory research (CBPR) with American Indian and Alaska Native communities creates distinct interventions, complicating cross-setting comparisons. In this study, coding CBPR intervention activities from three communities for protective factors and latent class analysis identified five patterns of exposure to protective factors: Internal, External, Limits on alcohol, Community and family, and Low probabilities of all protective factors. Patterns differed significantly by community and youth age. Standardizing protective factors by the functions an intervention serves instead of its form or components can assist in refining CBPR interventions and evaluating effects in culturally distinct settings.

Community-based participatory research (CBPR) aims to involve communities in every aspect of the research process, including planning, measurement development, implementation, analysis, and interpretation. Because of this, CBPR interventions differ from manualized interventions in that their composition, dosage, and even core activities are not predetermined. Requirements to engage in fixed components of an intervention contradict key elements of CBPR, most notably the collaborative creation and control of the research and intervention processes (1, 2). Thus, multiple communities working within the same intervention framework using a CBPR paradigm may produce interventions that differ in components or their form (2, 3). According to a functional viewpoint of preventative intervention, an intervention can vary across settings in *form* because variations of activities can have similar underlying prevention *functions.* Instead of standardizing the core components of intervention as repetition of the same activities, interventions can rest on their functions. This viewpoint allows for CBPR intervention to create locally controlled activities developed to fit diverse community contexts and priorities. The question

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underlying this study is how can these types of community interventions be understood through their functions?

Risk and protective factors are central to the public health model of prevention (4, 5). Risk factors function to increase the likelihood of disorder and protective factors function to decrease likelihood. Multiple forms of intervention activities may all promote similar protective factors. For example, water purification methods vary substantially by location and water chemistry, yet provide very similar protective effects (6).

In the Yukon-Kuskokwim region of Southwest Alaska where this research was conducted, each rural Yup'ik community possesses distinctive elements of local culture, history, risk patterns (e.g., for suicide and alcohol abuse) and correspondingly unique perceptions of need and targets for preventive interventions. Thus, the CBPR intervention process across multiple communities resulted in adaptations to the form of intervention (7) though emphasizing similar protective factors was their function.

Using data from a universal preventive CBPR intervention designed to promote protection from suicide and alcohol abuse among Alaska Native (AN) youth, we address three research questions: 1) are there recurring patterns of protective factors underlying intervention activities implemented by different communities, 2) are there community differences in protective factor exposure accounted for through heterogeneity in the cultures of communities (for example, is protection from alcohol a more important community concern in one community), and 3) are there individual differences in intervention activities attended/protective factors emphasized (for example, some intervention activities might be more attractive to younger as compared to older youth)?

Method

Sample

Demographic data for participants in Community 1, Community 2, and Community 3 are presented in Table 1. Approximate total population of each community was 650, 530 and 750, respectively. All youth reported their ethnicity as Yup'ik and their age as 12–17 (M=14). Out of approximately 100 youth in Community 1, 58 participated, 66 of approximately 100 youth participated in Community 2, and 71 of approximately 120 youth participated in Community 3.

Measures

Community research personnel collected data on attendance of each youth at each intervention activity in each community and the type of activity. Demographic information was collected from youth self-report. Twenty-six (26) youth in Community 3 did not provide gender information on the demographic form. In Communities 1 and 2 gender information was missing for 5 and 8 youth respectively.

Intervention Description

This project is part of a long-term collaboration between AN community co-researchers and investigators from the Center for Alaska Native Health Research (CANHR) at the University of Alaska Fairbanks (UAF). In each community, a Community Planning Group that included youth, elders, parents, service providers, community leadership, church representatives, and university researchers developed interventions. Development of community organizational structures to support the program took approximately one year, followed by development and delivery of activities over an additional one and a half years in each community. A more complete description of this CBPR intervention development process is provided elsewhere (8–10).

Qungasvik, a Yup'ik word meaning "toolbox," is a prevention program toolkit providing very basic outlines for prevention activities the community can choose from and adapt. Each activity stresses one or more of 12 protective factors (11). These are described in Table 2 and were identified through a program of collaborative research between university researchers and AN leadership (1, 12). In Alaska, youth, parents, and other adults engage in subsistence activities together. The *Qungasvik* describes a subsistence activity, "Berry Picking," and how it can promote *ellangneq,* communal mastery, clear expectations, and affection/praise:

> "A berry patch is a good place to learn connection to the land (*ellangneq*). … [P]icking the berries and making *akutaq* [Eskimo ice cream] together provides youth with communal mastery. This is a good chance for parents and adults to provide clear expectations and limits, while giving plenty of affection and praise." (p. 68)

Instead of being a prescriptive manual dictating precise components for each intervention activity, the *Qungasvik* is a compendium of cultural activities that serve as a starting point in development of interventions contextualized to customs and history of each local community, built around the same protective factors. This approach was designed as responsive to variation across communities as well as to maximize community ownership and control.

Community members with the assistance of project staff delivered the resulting prevention activities. The UAF IRB, the Human Studies Committee of the Yukon Kuskokwim Health Corporation (the regional Alaska Native health corporation), and the local tribal councils in each community approved all procedures.

Analysis Plan

Analysis began by coding every intervention activity in each community for the protective factors it emphasized. Coding was guided by the *Qungasvik* manual, which indicates protective factors each activity was developed to promote. Research and community staff monitored each intervention activity in all communities, assessing delivery of the activity as planned and the effectiveness of activities in promoting intended protective factors. To assess adherence to the intervention, in one community five intervention activities were video recorded and viewed by two independent raters for their adherence to the activity delivery of protective factors contained in the *Qungasvik*. Inter-rater reliability statistics (13) calculated between coders for each ranged from .87 to 1.00, with a mean of .95. On average, raters agreed that 88% of the process that included protective factors delivery in the *Qungasvik* outline were implemented.

We next created binary indicators for each youth to identify the protective factors to which he or she had been exposed, resulting in a data matrix whose rows were individual youth in the three communities and whose columns were the protective factors ('1' = 'exposed' or '0' = 'not exposed'). With this data matrix as a basis, latent class analysis (14), a statistical procedure that produces groups with distinct profiles of categorical variables, was applied to model the latent structure of the distributions of protective factors for all participants across communities. This was necessary because of the small sample size, and it was desirable because it provided a common solution that allowed us to compare the interventions of different communities. We confirmed the latent class solution by re-running the model using a cluster analysis method. Finally, we used multinomial logistic regression to predict latent class assignment from community and individual demographic variables.

Results

Using Latent Gold software (15) we fit latent class solutions of one through 10 classes and determined the optimal solution by comparing indices of model fit. The Bayesian Information Criterion (BIC; 16) indicated a five-class solution as optimal. Classification errors for the five-class solution were low (3.15%) while accounting for 96.8% of the variance in the observed variables. We confirmed this solution by rerunning it using K-Means cluster analysis (17). Both latent class analysis and K-means have demonstrated high accuracy for reproducing known cluster solutions with binary variables (18). The K-means analysis with five clusters reproduced the latent class solution at far better than chance levels (*Cramer's V* = .71, $\chi^2(16, N=195) = 390.42$, $p<.001$), with three of the five classes reproduced at close to 100% accuracy. These results supported the five-class solution as a faithful rendering of the observed data.

Table 3 provides latent class counts for the total sample, while Figure 1 illustrates the means of each of the five classes on the twelve protective factors targeted by the intervention. Persons in Class 1 (29.2% of the sample) had high probabilities of exposure to the protective factors of Self-Efficacy and *Ellangneq*, a Yup'ik word describing the awareness of interconnection (12, 19), along with low probabilities of exposure to the protective factors of Being Treated as Special, Affection/Praise, and Family Models of Sobriety. For this reason, we named this class "Internal Orientation." Class 2 (27.7% of the sample) had high probabilities of exposure to Communal Mastery and Clear Expectations and low probabilities of exposure to Giving, Affection/Praise, and Family Models of Sobriety, and was named the "External Orientation" class. Only Class 3 (18.5% of the sample) had a high probability of exposure to Limits on Alcohol Use (along with other factors), and we labeled it "Limits." Like Class 2, Class 4 (14.8% of the sample) had high probability of Communal Mastery and Clear Expectations, but unlike Class 2, Class 4 also had high probabilities of exposure to Giving, Being Treated as Special, and Family Models of Sobriety. We named this class "Community/Family." Finally, Class 5 (9.8% of the sample) had low probabilities of exposure to all protective factors, and was named the "Low Protection" class.

Because we were aware of potential intervention differences in response to community differences in needs and priorities, we expected community differences in protective factors exposure. However, we reasoned that a regression model assessing community differences should include individual differences as control variables to minimize the influence of potential confounds.

Using multinomial logistic regression analysis implemented in SPSS with Class 5 ("Low Protection") as the comparison level, we predicted the odds of being in Classes 1 through 4 using community, gender, and age of participants as predictors. All three variables were significant or marginally significant predictors. As anticipated, community was by far the strongest predictor ($\chi^2(8, N=156) = 153.33$, $p<.001$). Table 3 provides a cross-tabulation of number of individuals in each latent class by community. The significance tests evaluate differences between observed and expected cell counts. Each community emphasized one class of protective factors to a greater extent than expected by chance. The Community 1 intervention emphasized "Limits" at greater than chance levels. The Community 2 intervention tended to include more activities that emphasized the "Community/Family" and the Community 3 intervention had a preponderance of activities emphasizing "External" protective factors. Communities did not differ significantly in emphasis of "Internal" protective factors.

The logistic regression analysis also found a significant effect for age ($\chi^2(1, N=195) = 6.22$, $p<.05$) and a marginally significant effect for gender ($\chi^2(1, N=195) = 3.77$, $p<.10$). Older youth were less likely to participate in activities emphasizing the Class 2 (External) protective factors (Odds Ratio = .60).

Discussion

The current report provides an innovative analytic framework for the study of function as the unit of analysis in intervention fidelity. We have developed an adaptive intervention premised on the need to respond to important subcultural differences across geographically isolated Yup'ik villages. This flexibility is also critical to the local control essential to successful CBPR interventions. We assert that an intervention's functions can be defined through a protective factors model conceived as the theorized processes involved in change. Furthermore, these functions, and not the form of intervention activities, is the proper unit of analysis in studying intervention integrity.

The Neyman-Rubin causal model, on which most intervention research is based, assumes that each individual assigned to a particular intervention receives exactly the same intervention. This Stable Unit Treatment Value assumption (SUTVA; 20) is violated in multi-site CBPR studies when each community can design a different intervention. It may be violated even in manualized studies if individuals do not attend all sessions, or if persons delivering the intervention vary in their fidelity to the intervention as designed. We undertook this investigation in hopes of identifying a approach for study of exposure to the preventive function in a CBPR community intervention where differences across settings may create interventions that differ substantially in their component activities. Determining dosage as individual protective factors exposure provides a common metric across communities that can be used to refine as well as evaluate intervention. Fidelity can be assessed by determining the extent the intervention as delivered emphasized the intended protective factors.

Coding each intervention activity for its intended protective factors is necessary for applying this method. In this study, the *Qungasvik,* with its explicit lists of protective factors associated with each activity, made coding simpler than is likely to be the case in interventions whose activities are not explicitly linked to protective factors. Because of the large number of protective factors emphasized in this study, we used simple indicator variables for whether or not an individual was exposed to each protective factor. Had there been fewer protective factors involved, we could have tabulated the number of sessions in which each individual was exposed to each protective factor, providing measures of the intensity of exposure.

We used latent class analysis to simplify interpretation of the complex patterns of protective factors involved. If the intervention had only aimed to promote a few protective factors, a data reduction method may not have been needed. Each participant would have been assigned scores representing exposure to each protective factor. The latent class analysis in this study, and in similar studies emphasizing multiple protective factors, makes it possible to represent complex patterns through relatively few groupings.

In this study, the logistic regression returned results consistent with the CBPR principles underlying the intervention, namely that community accounted for a large proportion of the variance in each individual's exposure to protective factors. There was some evidence that the specific protective factors emphasized in each community's intervention reflected local community values, history, and priorities. For example, Community 1, having experienced several alcohol-related suicides, emphasized limits on alcohol use.

This study also found significant effects for individual age, and a marginally significant effect for youth gender. In this study, the relatively modest effect of age may reflect older youth skipping some activities possibly perceived as more appropriate for younger youth, or different-aged groups beginning intervention at different times and thus missing some activities (7).

The method employed in this study can be used to refine the *Qungasvik* intervention or others like it. Each community's intervention can be coded for the protective factors emphasized, and the results fed back to researchers and community members planning the intervention to assure that the intended protective factors are represented.

We believe that this method may be useful in refining and evaluating non-CBPR interventions as well. Even though manualized interventions may have a consistent set of activities across settings, these results suggest individual differences may also result in differences in exposure to change mechanisms. The growing field of implementation science (21, 22) is beginning to take note of the variance in the delivery of even manualized, carefully monitored interventions (23). Future research can apply the method reported in this study to determine the patterns of protective factors received by participants in manualized interventions.

One potential limitation of the present study is that analyses predicting outcome from the latent classes are not included. However, inclusion of such an analysis would have shifted the focus away from development of a method for identifying a standardized unit of intervention dose focused on the function of intervention. Whether an intervention produces outcomes demonstrating efficacy is a separate research question from the testing of this approach. We intend to apply this method to outcome analysis when data from the entire trial becomes available. A second limitation is missing data. Gender information was not recorded among a subset of participants in one community, making interpretation of the gender effect problematic despite the use of analytic methods that reduced the likelihood of biased results.

Multi-site studies are often necessary to attain sufficient statistical power for outcome analyses, as well as to demonstrate interventions are generalizable across settings. However, because components of the intervention can differ across communities when implementing the same CBPR intervention, such multisite studies must either erroneously assume that the same intervention is being delivered at each site (the Stable Unit Treatment Value Assumption; 20) or analyze each site separately, losing the advantages of a multi-site trial. The method developed in this study permits unified analysis of data from multisite CBPR intervention studies, with broader implications for usefulness beyond CBPR studies.

Preventive interventions often function to increase protective factors that reduce or buffer risk. Examining protective factors promoted by an intervention moves beyond focus on the superficial forms of intervention to its functions. Consistent with a public health model, we suggest functions of a preventive intervention are best represented by the protective factors emphasized. By allowing systematic study of intervention integrity beyond repetition of core component activities, this approach facilitates an understanding of CBPR and other complex community interventions through interactive functions beyond the individual level (3). Using the current approach, intervention integrity in complex interventions can be studied through degree of fit with protective factors that are the hypothesized functions in a theory of change.

Built into this adaptive intervention is an assumption that the components or form each community adopts in a given intervention activity can vary in important ways in response to local context while still delivering to deliver these same protective factors. What makes a replicable intervention is delivery of the same protective factors through different specific activities. The current report proposes an innovative analytic framework for the study of function as the unit of analysis in fidelity. Coding intervention activities for their protective factors and, if necessary, simplifying the codes using a data reduction method produces results that can be used to refine interventions in partnership with communities, and potentially to evaluate effects of complex interventions with stronger causal inference than would have been otherwise possible.

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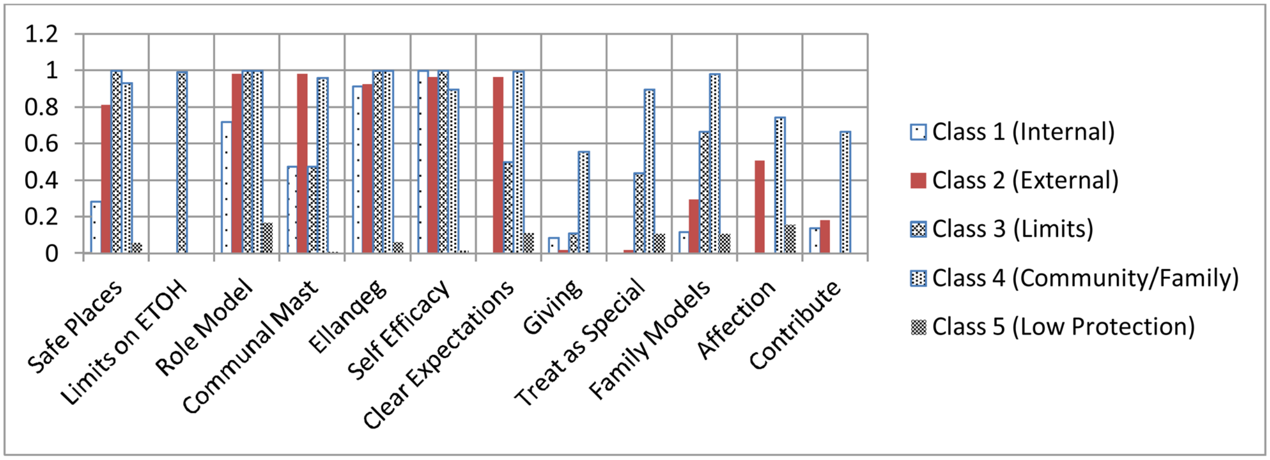

Figure 1.
Probabilities of protective factors being emphasized by latent classes.

Table I

Youth Demographic Characteristics

Variable	Community 1	Community 2	Community 3
Gender			
Male	30	27	30
Female	23	31	15
Mean Age (SD)	14.24 (1.72)	14.62 (1.96)	14.69 (1.82)
Grade			
6	0	0	16.9%
7	45.3 %	35.6 %	3.9%
8	18.9 %	28.9 %	26.0%
9	13.2 %	15.6 %	10.4%
10	7.5 %	4.4 %	7.8%
11	9.4 %	8.9 %	22.1%
12	5.7 %	6.7 %	13.0%
Parental marital status			
Married	72 %	88 %	67%
Single	24 %	10 %	33%
Divorced	4 %	2 %	n/a
Adults living at home			
Mother	70.4 %	56.9%	64.9%
Father	64.8 %	72.5 %	58.4%
Grandparent	29.6 %	21.6 %	20.8%
Other relative	9.3%	17.6%	15.6%

Table 2

People Awakening Protective Factors

Protective Factor	**Definition**
	Individual Protective Factors
Self-efficacy	This is the protective belief in yourself as someone who can solve your own problems.
Communal Mastery	This is a sense that you can solve your own problems by working together with other people in your life. It includes a confidence that others from your family and community are there to help you, and that working with them is the best way to solve your problems.
Wanting to be a Role Model	It is a choice to live a good way, as an example to others, because a person sees their actions can influence others' behavior.
Ellangneq	Ellangneq is best understood as awareness, as in being aware of the consequences of your own actions and how they affect family and community. It also means being conscious of your developing relationship with God/*Ellam Yua*.
Giving	This is a protective sense of responsibility to family and community.
Protective Factor	Definition
	Family Protective Factors
Affection/Praise	Yup'ik families show pleasure in a child's actions in many ways, and give praise for behavior of merit.
Being Treated as Special	Caregivers teach children they have a special place in the world and a unique role to fulfill.
Clear Expectations	Protective families define acceptable behavior for the child, clearly and consistently.
Family Models of Sobriety	Family members model sobriety and encourage others to be sober.
	Community Protective Factors
Safe Places	Protective communities have safe places for youth to go, free from substance abuse and violence.
Role Models	Protective communities have community role models outside of each youth's own family. These can include elders, community leaders, and others who work hard to do their best and give back.
Limits on Alcohol Use	Protective communities enforce local alcohol laws and youth curfew laws.

[a]Adapted from Alakanuk Community Planning Group et al. (11)

Table 3

Latent Class Counts by Community

Latent Class	Community						Total	
	1		2		3			
	n	%	n	%	n	%	n	%
Class 1 (Internal)	20	34.5%	19	28.8%	19	26.8%	58	29.7%
Class 2 (External)	1**	1.7%	14	21.2%	39**	54.9%	54	27.7%
Class 3 (Limits)	36**	62.1%	0**	0.0%	0**	0.0%	36	18.5%
Class 4 (Community/Family)	1**	1.7%	22**	33.3%	5*	7.0%	28	14.4%
Class 5 (Low Protection)	0*	0.0%	11*	16.7%	8	11.3%	19	9.7%
	58		66		71		195	

* $p < .05$.

** $p < .01$.

Note: Significance tests compare observed with expected cell counts.