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Multi-Level Cultural Intervention for the Prevention of Suicide and Alcohol Use Risk with Alaska Native Youth: a Nonrandomized Comparison of Treatment Intensity

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Abstract Suicide and alcohol use disorders are primary determinants of health disparity among Alaska Native people in contrast to the US general population. *Qungasvik*, a Yup'ik word for toolbox, is a strengths-based, multi-level, community/cultural intervention for rural Yup'ik youth ages 12–18. The intervention uses "culture as intervention" to promote reasons for life and sobriety in young people using local expertise, high levels of community direction, and community based staff. The intervention is grounded in local practices and adaptive to local cultural differences distinctive to rural Yup'ik communities. The current study compares the effectiveness of high-intensity intervention in one community (treatment), operationalized as a high number of intervention activities, or modules, implemented and attended by youth, contrasted to a lower intensity intervention in a second community (comparison) that implemented fewer modules. A Yup'ik Indigenous theory of change developed through previous qualitative and quantitative work guides intervention. In the model, direct intervention effects on proximal or intermediate variables constituting protective factors at the individual, family, community, and peer influences levels lead to later change on the ultimate prevention outcome variables of Reasons for Life protective from suicide risk and Reflective Processes about alcohol use consequences protective from alcohol risk. Mixed effects regression models contrasted treatment and comparison arms, and identified significant intervention effects on Reasons for Life (d = 0.27, p < .05) but not Reflective Processes.

Keywords American Indian/Alaska Native · Community-based participatory research · Community intervention · Suicide · Alcohol

Epidemiological data identify suicide and alcohol use disorder (AUD) as primary determinants of health disparities among Alaska Native people, in contrast to the US and the Alaska general population. Alaska Native youth suicide constitutes a public health crisis; while suicide is 11th leading cause of death in the USA, it is fourth leading cause of death for Alaska Native people, and tragically, the leading cause of death for 15–24-year olds (Allen et al. 2011). Despite significant gaps, existing research suggests a similar unsettling trend of higher AUD among Alaska Native people, particularly in rural settings. Alaska Native people experience the highest rates of AUD in Alaska and die from alcohol-induced health conditions at four times the Alaska general population rate (Hull-Jilly and Casto 2013). Binge drinking is of high

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prevalence; in one Alaska Native rural community sample, 61% of men and 37% of women screened engaged in binge drinking in the past year, defined as five or more drinks on one occasion (Seale et al. 2006). Though the relationship of alcohol to suicide is complex, existing epidemiological data document high rates of co-occurrence of American Indian/Alaska Native suicide and AUD, with youth at substantial risk (Barlow et al. 2012).

Though several of the existing reviews are dated, reviews of the indigenous youth suicide (Middlebrook et al. 2001; Clifford et al. 2013) and substance use (Hawkins et al. 2004; Whitbeck et al. 2012) iterature all converge on two recommendations: (a) more culture-informed, strengths-focused interventions are needed, and (b) more rigorous designs are necessary to establish intervention efficacy. These reviews also highlight the crucial importance of cultural relevance and ongoing community involvement.

While scope and magnitude of the problem cannot be understated, there exist equally compelling Indigenous cultural strengths that are sources of resilience. Across rural Alaska, Alaska Native people maintain an aboriginal subsistence way of life as hunters and gatherers, while simultaneously engaged in a global economy. The largest Alaska Native group is the Yup'ik, representative of the highest ratio of fluent Indigenous language speakers of any Native group in the USA (Fienup-Riordan 2000). Embedded in the persistence of these and other Yup'ik practices are foundations for health and well-being, providing materials for "culture as prevention," innovative prevention strategies that vitalize key protective elements of culture.

Three conclusions can be drawn from this brief review. First, existing data documents an enormous health disparity. Alaska Native people constitute an at-risk population in an at-risk state, with rural Alaska Native males experiencing greatest risk (Allen et al. 2011). Acute need exists for design, implementation, and testing of effective prevention strategies. Second, this same data suggests that suicide and AUD often co-occur in this population, and interventions are needed to address co-occurring risk. Third, robust cultural practices present opportunity to devise innovative cultural interventions (Ayunerak et al. 2014).

Whitbeck et al. (2012) note two worlds of prevention in tribal communities: One world consists of practices grounded in local understandings, while a second involves clinical trials that "continue to work from a Western colonial paradigm that ignores, diminishes, and reinterprets Native ways of knowing" (p. 433). Using a community-based participatory (CBPR) framework, Yup'ik communities over the past 25 years have guided a melding of these two worlds, by generating *Qungasvik* "Toolbox," a cultural intervention based in a local, Indigenous theory of personal and community change, then collaborating with university researchers to describe it using the methods of western science (Allen et al. 2014a). In contrast to most American Indian and Alaska Native preventive interventions that are problem-focused and individual-level, this intervention is strengths-based and multi-level. Mohatt et al. (2014) demonstrated that the intervention produced dose-related growth on intermediate and ultimate outcome variables protective from suicide and AUD.

This report describes a test of efficacy of the *Qungasvik* intervention, comparing impact of high versus low intervention intensity. The study is part of a larger ongoing multisite, staggered baseline, dynamic wait-listed design (DWLD; Wyman et al. 2015) prevention trial. Our CBPR efforts with community partners include ongoing analysis and community dissemination of interim results. These efforts identified a naturally occurring comparison of effectiveness by dose; two communities in the early DWLD roll out provided a contrast of impact of higher to lower number of intervention modules at a similar time point. We present these results as a test of the *Qungasvik* intervention for intended intervention effects.

Method

Setting

Yup'ik communities in southwest Alaska are hundreds of miles off the road system, and accessible only by boat, small plane, or snowmobile. Ethnicity is over 90% Yup'ik. In contrast to the reservation system in the lower 48 states, most of these remote communities are federally recognized tribal entities. Residents are shareholders in the Alaska Native Regional Corporation, and the regional nonprofit health corporation provides universal medical care. Elders speak Yup'ik as a first language, while youth are English first language, and may or may not speak Yup'ik. A subsistence economy is augmented by a limited number of tribal, state, and federal jobs, primarily in government, health care, and schools.

Given high transportation costs and a precipitous decline in the salmon fishery—a long-standing income source—cost of consumer goods places heavy economic burden; these communities are among the 10 lowest per capita income counties in the USA. Food is heavily dependent on local fish, birds, and land and marine mammals. In response to the devastating impact of alcohol, as is the case for most of rural Alaska, the two communities that are the focus of the current study used the Alaska local option law at the time of this study to declare themselves dry—making importation and possession of alcohol illegal.

Participants

Treatment Arm Community (Community 1) Sixty-one youth were recruited to participate in the intervention from approximately 100 12–17-year olds residing in Community 1. Sixty youth completed Wave 1 assessments, 46 completed

Wave 2, 43 completed Wave 3, and 61-completed Wave 4; 37 youth completed all four waves, 8 completed three assessments, and 10 completed two assessments. Figure 1 provides a CONSORT flow diagram. As small sample analyses are particularly susceptible to influence from outlying observations, we identified multivariate outliers using hierarchical cluster analysis (Henry et al. 2005), a statistical method that detects homogenous clusters of cases by iterative groupings based on distance computation. One youth distant from others, along with five youth who completed only the final assessment, was dropped from the analysis, resulting in 54 participants. Mean age at Wave 1 was 14.2 years (SD = 1.72). Gender distribution was 31 females and 23 males, and there was no significant age difference between males and females ($t(52) = .73$, *ns*).

Comparison Arm Community (Community 2) Seventy-seven youth were recruited from the approximately 150 12–17-year olds residing in Community 2, all of whom completed Wave 1. Seventy-five youth completed Wave 2, 60 completed Wave 3, and 48 completed Wave 4, resulting in 34 youth that completed all four waves of assessment, 7 that completed three assessments, and 34 that completed two assessments. Using hierarchical cluster analysis, we identified one youth distant from others, resulting in 74 participants. Mean age at Wave 1 was 14.6 years (SD = 1.82), and gender distribution was 20 females and 54 males, with no significant age difference between males and females ($t(72) = -1.99$, *ns*). Demographic data by community are presented in Table 1. Samples differed in gender composition with more males in the comparison community, and while mean age was similar, the distribution in

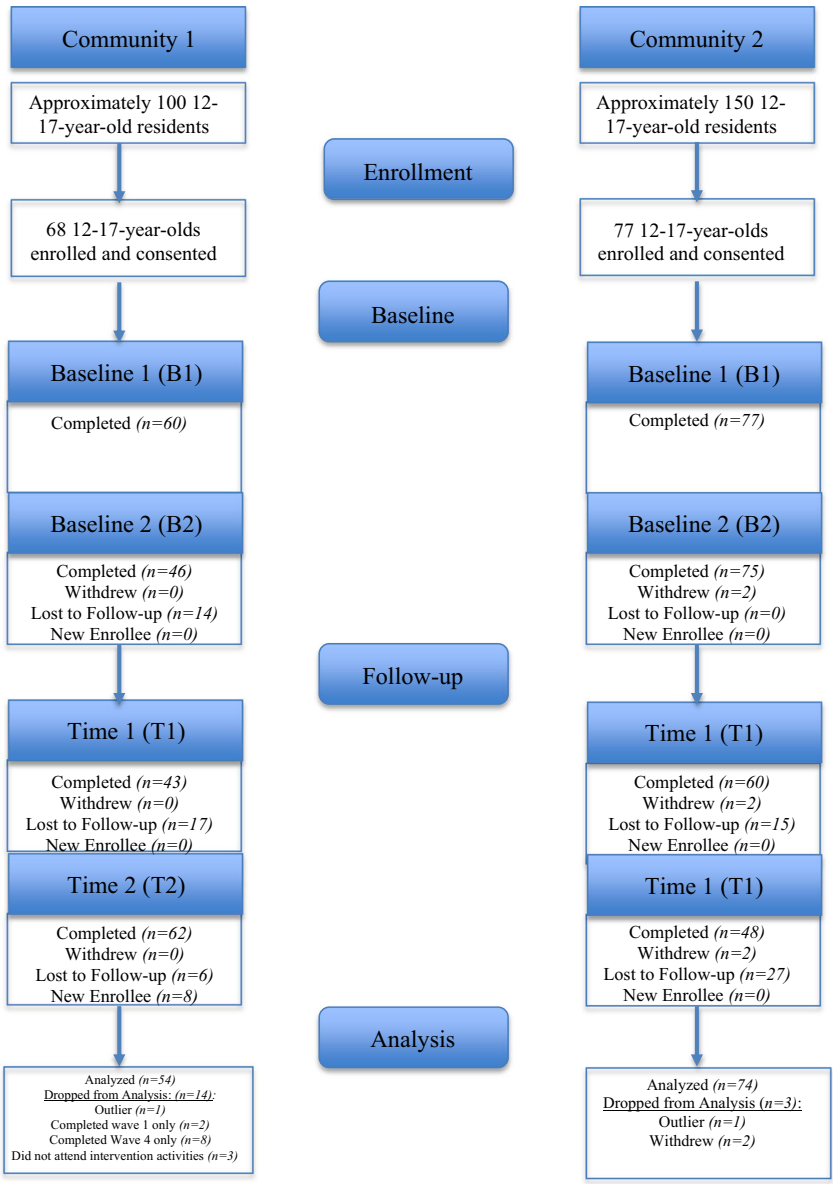

Fig. 1 CONSORT flow diagram

Table 1 Youth demographic characteristics

Variable	Community 1	Community 2
Gender		
Male	23	54
Female	31	20
Mean age (SD)	14.24 (1.72)	14.62 (1.82)
Grade		
7	45%	4%
8	19%	27%
9	13%	11%
10	8%	7%
11	9%	22%
12	6%	12%
Parental marital status		
Married	72%	68%
Single or divorced	28%	8%
Adults living at home		
Mother	70%	65%
Father	65%	58%
Grandparent	30%	19%
Other relative	9%	14%

Community 2 included fewer grade 7, and more grade 11 and 12 participants. All youth reported Yup'ik ethnicity.

Qungasvik Intervention Procedures

The *Qungasvik* intervention implements modules that constitute episodes of Yup'ik cultural engagement. Modules are individual, family, or community level, and delivered in one or more 1–3 h sessions. Each module promotes two to four of 13 protective factors identified in a culture-specific model of protection.

The *Qungasvik* intervention manual is not prescriptive. Instead, it provides outlines for 26 modules, along with a process for community adaptation to local customs and circumstances, the current season, and advice of community members. Our co-researchers observed the adaptive process results in greater community ownership and intervention that is more ecologically valid to distinctive characteristics of each remote community in the region. The intervention reflects assumptions that components, or form, can vary in important ways to respond to local context. The core elements of the intervention process and delivery of protective factors are what is replicated (Henry et al. 2012). In defining systematic intervention integrity beyond repetition of component activities, the *Qungasvik* approach facilitates understanding of complex interventions through their interactive functions (Trickett et al. 2011). Fidelity involves adherence to functions rather than fixed components; in *Qungasvik*, function is defined through (a) delivery of the protective factors assigned in each module and (b) use of the *Qasgiq* implementation model (Rasmus et al. 2014).

Qasgiq is both name of the historical communal men's house in each aboriginal Yup'ik community and a cultural model of social organization. Intervention fidelity includes adherence to these Yup'ik cultural protocols that guide a process of (a) always coming together as a group to plan important activities, (b) identifying those with expertise to carry out the activity, and then after the activity, (c) de-briefing on where the activity succeeded in its goals and what has been learned. In the implementation model, different cultural experts are nominated to contribute to planning and delivery of different modules. In particular, individuals recognized as "Elders" for their cultural knowledge and leadership are used extensively.

In one example of a *Qungasvik* module, coastal communities teach youth cultural values and provide a protective factor experience through the *Maliqianeq* (seal hunt) module. The module provides training in safety, team work, hunting skills, and elements of Yup'ik worldview. Youth may also learn values through the concepts of *Mercecineq* and *Allaniuneq*, which describe how the seal decides to give up life as a gift to the hunter, and how hunters in response are to do such things as give water to the seal, and to place the seal head pointing toward the river when cutting it up, to ensure its spirit safe journey home. Protective factors promoted are *Ellangneq*, "to become aware," and communal mastery, or efficacy through problem-solving strategies of joining with others in the social environment. The module has been adapted by communities into beluga whale hunt, and by inland communities into moose hunt, to teach these same values and protective factors. More detailed description of the intervention, Yup'ik terms, the process of engagement, and the *Qasgiq* intervention implementation model can be found in Rasmus et al. (2014).

Community Enrollment

Community 1 was an intervention development community for the *Qungasvik* intervention; our research team was invited to co-develop the intervention here by community leadership and tribal resolution. Community 2 was enrolled into the larger DWLD outcomes study, for which we approached "larger" population communities to maximize sample size in this area in Southwestern Alaska. Communities then elected to invite our team to conduct the intervention through tribal resolution. Enrollment in the DWLD ended when three communities were recruited, and intervention start order was randomly assigned with Community 2 assigned first in order.

Measures

Gonzalez and Trickett (2014) described measure development, and Allen et al. (2014b) tested a multi-level theory of change measurement model. In the model, change in intermediate

variables at the community, family, peer influence, and individual levels, as an impact of intervention activities, leads to change in two ultimate outcome variables measuring protection from suicide and AUD risk. Supplemental Table S1 summarizes this measurement model.

Intermediate Outcomes

***Elluarrluni piyugngariluni*: "Learning in the Mind of Doing Things in a Masterful Way"—Individual Characteristics** Two subscales from the Multicultural Mastery Scale (Fok et al. 2012) tap mastery achieved through joining with friends (*Mastery-Friends*) and family (*Mastery-Family*) as elements of communal in contrast to individual mastery.

***Elluarrluteng ilakelriit:* "Nurturing Family"—Family Characteristics** The Brief Family Relationship Scale (Fok et al. (2014) cultural adapts the Family Environment Scale relationship dimension (Moos and Moos 1994) *Cohesion*, *Expressiveness*, and *Conflict* subscales.

***Nunamta:* "Our Community"—Community Characteristics** The Youth Community Protective Factors Scale, adapted from the Yup'ik Protective Factors scale (Allen et al. 2006), taps youth perceptions of *Support* and *Opportunities* as two protective community subscales.

***Maryarta:* "One who Leads"—Peer Influences** Two scales from the American Drug and Alcohol Survey (Oetting and Beauvais 1990), used extensively with American Indian youth, were adapted to measure rural Alaska Native youth peer attitudes that discourage alcohol and other drug use as protective peer influences in the young person's social environment.

Ultimate Outcomes

***Umyuangcaryaraq*: "Reflecting"—Reflective Processes** Reflective Process (RP) (Allen et al. 2012) was adapted from the adult Yup'ik Protective Factors scale (Allen et al. 2006) to tap youth reflection on potential negative consequences from drinking alcohol that have elements of culture-specific meaning. Representative items include "I would feel embarrassed to have drinking in my family" and "I do not want to lose control of myself."

***Yuuyaraqegtaar*: "A Way to Live a Very Good, Beautiful Life"—Reasons for Life (RL)** RL is a cultural adaptation and strengths-based extension of the Brief Reasons for Living Inventory for Adolescents (Osman et al. 1996), which was itself based in the Reasons for Living Inventory (Linehan et al. 1983) orginally devised for adults. Items tap elements that provide meaning in life, including culture-specific beliefs and experiences that make life enjoyable and worthwhile within a rural Yup'ik context. Representative items include "My Elders teach me that life is valuable" and "People see I live my life in a Native way."

Data Analyses

The Qungasvik intervention is intended as a community intervention. We constructed an analytic model to address challenges in implementation and design typical to community-level intervention (Trickett et al. 2011). These challenges are amplified in rural arctic Alaska in ways similar to research in other geographically remote locations, and in ways aligned with features unique to the Yup'ik cultural context. For example, in accord with Yup'ik cultural values emphasizing choice and autonomy of the individual, including young people, intervention was open to all youth to pick and choose activities they wished to attend. Similarly, consistent with values, community activities are open to all, late enrollees were accepted at any time, and youth entered the intervention at different times.

To evaluate intervention effects in the high contrasted to the lower intervention intensity community, we created mixed effects regression models (Hedeker and Gibbons 2006) across four waves of assessment. Baselines 1 and 2 (B1 and B2) were prior to intervention, Time 1 (T1) was midway through intervention, and Time 2 (T2) occurred following approximately 12 months of intervention. Also known as hierarchical linear modeling (HLM; Raudenbush and Bryk 2002), this allowed for the clustering of observations within individuals and, permited evaluation of the impact of four potential confounding variables: (a) pre-existing differences in protection for each individual, (b) duration of participation for each individual, (c) cohort in which each youth began intervention, and (d) pre-existing differences in each measure on the level of community. Pre-existing protection was estimated using Wave 1 scores on the Community Protective Factors *Support* subscale and then converted through a median split procedure to high and low-protection groups represented by a dummy code comparing high with low-protection participants. Because participants entered the intervention at different times, time (in months) was centered at the date each individual started intervention. The cohort in which each youth began intervention (cohort 1, 2, and 3) was represented by a dummy code that compared cohort participants.

Community consisted of a dummy code to contrast the treatment community with the comparison arm community. At level 1, the outcome variable at each of the four time points was predicted from an individual intercept, linear time slope, community, and interactions. At level 2, the individual level, the level 1 coefficients were predicted by B1 protective factor scores (pre-existing protective factors) and when the

Table 2 Psychometric properties of outcome measures: reliabilities and correlations among measures at Wave 1

Measure	No. of items		Coefficient *alpha* (Wave 1)		Item separation reliability		Person separation reliability		1	2	3	4	5	6
	C1	C2	C1	C2	C1	C2	C1	C2						
1. Individual Characteristics (IC)	10	8	.69	.87	.85	.91	.65	.40	–	.52**	.36**	−.18	.57**	.37**
2. Family Characteristics	19	16	.74	.80	.85	.94	.65	.73	.33**	–	.46**	.07	.40**	.35**
3. Community Characteristics	7	6	.62	.77	.84	.84	.57	.20	.28*	.44**	–	−.09	.36**	.38**
4. Peer Influences	10	10	.96	.93	.70	.29	.83	.09	.02	.14	.15	–	−.24*	.02
5.Reflective Processes	5	5	.49	.72	.77	.98	.21	.54	.39**	.45**	.33**	.05	–	.14
6. Reasons for Life	5	5	.78	.63	.92	.90	.71	.61	.50**	.36**	.62**	.20	.45**	–

C1 Community 1 ($N = 54$), *C2* Community 2 ($N = 74$). Correlations in the subdiagonal are for Community 1 ($N = 54$); correlations in the superdiagonal are for Community 2 ($N = 74$). * $p < .05$ ** $p < .01$

*$p < .05$; **$p < .01$

individual became involved in the intervention (cohort). In HLM notation, the model may be expressed as follows:

Level 1 (time):

$$Y_{ij} = B_{0j} + B_{1j}(\text{time}) + B_{2j}(\text{community}) + B_{3j}(\text{time*community}) + \text{eij}$$

Level 2 (individual)[1]:

$$B_{0j} = G_{00} + G_{03}(\text{high vs.low protection}) + G_{04}(\text{cohort 2 vs 1}) + G_{05}(\text{cohort 3 vs 1}) + u_{0j}$$

$$B_{1j} = G_{10} + G_{13}(\text{high vs.low protection}) + G_{14}(\text{cohort 2 vs 1}) + G_{15}(\text{cohort 3 vs 1}) + u_{1j}$$

$$B_{2j} = G_{20} + G_{23}(\text{high vs.low protection}) + G_{24}(\text{cohort 2 vs 1}) + G_{25}(\text{cohort 3 vs 1}) + u_{2j}$$

$$B_{3j} = G_{30} + G_{33}(\text{high vs.low protection}) + G_{34}(\text{cohort 2 vs 1}) + G_{35}(\text{cohort 3 vs 1}) + u_{3j}$$

Results

Psychometric Operating Characteristics of Outcome Measures

Table 2 reports number of items, and coefficient *alpha*, item separation, and person separation reliabilities, and scale intercorrelations by community at Wave 1. *Alpha* ranged from acceptable to excellent (α = .62–.96), with exception of RP in Community 1 (α = .49).

Fok and Henry (2015) describe how intervention measures, particularly in small samples, require high sensitivity to change. While coefficient *alpha* reliability taps item interrelation, a critical understudied attribute in intervention research is a measure's sensitivity to change through item separation and person separation reliabilities. Based in item response theory conceptions of item and scale functioning, these indices make use of Rasch analysis techniques (Bond and Fox 2007). Item separation reliabilities provide an index of the extent the sample of individuals from each community is adequate to scale the item set and confirm its item hierarchy. Person separation reliabilities provide an index in each scale of the extent to which items separate individuals according to their levels of the latent trait; this taps the ability of scales to track different levels of the attribute under study, and change in the attribute in response to intervention.

The item separation reliabilities indicate that in general, each community sample displays good to excellent capabilities to scale each measure, with the lone exception of Peer Influences in Community 2. Here, item separation values fell to .29, suggesting significant limitations in the distribution of data, and the measure is unlikely to track any change among youth in the community. Person separation reliabilities generally displayed good capabilities to index individuals at different levels of the latent trait. However, three measures performed suboptimally: Individual Characteristics in Community 2 (.40), Community Characteristics in Community 2 (.20), and Reflective Processes in Community 1 (.21). Limitations in these measures' ability to discriminate between persons at different levels of the latent trait create limitation in their ability to capture change within each community over time. On Peer Influences in Community 2, person separation was virtually nonexistent (.09), strongly suggesting that measurement limitations would prevent identification of any change.

Correlations among outcome measures were low to moderate. This suggests each tapped unique variance and separate dimensions, with exception of RL with Community Characteristics.

[1] In Community 2, youth entered in two cohorts and the second cohort comparison term is dropped.

Evaluation of Intervention Effects

In Community 1, youth attended a mean (SD) of 6.78 (6.76) modules, while in Community 2, youth attended a mean (SD) of 2.31 (3.24) modules. Table 3 reports mean scale scores across communities and four waves of assessment over approximately 1 year. In Community 1, scores on each item were derived from an analog response format coded on a 5-point interval. In Community 2, an upgrade to our assessment software allowed coding on a 20-point interval. This change was to facilitate greater precision in our future measurement refinement efforts; scores were range-standardized prior to analyses to address this scaling issue.

Table 4 reports HLM results, including slope, standard error, t statistic, p value, and Cohen's d as a measure of effect size. Due to complexity of the model described, outcomes are reported only for time, community, protection, and time × community, which examined whether the effects of time differed by community. These analyses allow us to compare effectiveness of intensive (Community 1) to less intensive (Community 2) intervention. Results indicate intensive intervention in contrast to less intensive intervention produced impact on RL (d = .28, p < .05), but not RP or intermediate variables. This can be interpreted to indicate that the intervention produced significantly greater growth in protection from suicide, but not alcohol risk, within the treatment arm, in contrast to the comparison arm. Analyses found significant growth over time within Community 1 but not Community 2, on RL (d = .43, p < .05) but not RP, and on the individual characteristics intermediate variable (d = .34, p < .05), but not family or community characteristics, while peer effects grew in Community 2 but not Community 1 (d = .50, p < .01) (Supplemental Tables S2 and S3).

Functional data analysis (Ramsay and Silverman 2005) was used to explore the RL finding over time with greater precision. Figure 2 displays function estimates derived from RL scores at the four time points, along time ranges beginning 2.5 months prior to intervention (−2.5), to intervention start (0), and post-intervention (+12.3). The estimated treatment RL function (solid curve) is below comparison (dotted curve) at month −2.5 and crosses comparison during month 1. At 3 months, treatment RL declines, then after 6 months, increases back to higher levels.

Discussion

The primary finding identified impact of the *Qungasvik* intervention on outcomes protective from suicide risk among rural Yup'ik Alaska Native youth. A more intensive version of the *Qungasvik* intervention, defined as a higher dose implementation, produced significantly greater intervention impact in contrast to a lower dose. Dose was measured through number of intervention sessions each participating youth attended. Protection from suicide risk included beliefs and experiences that make life enjoyable and worthwhile, and that provide life meaning. This finding provides support for *Qungasvik* as a promising approach to prevention of suicide risk in these rural

Table 3 Mean scale scores at Waves 1–4 measurement points

Community 1					
Scale	Number of items	Wave 1 (N = 54) M (SD)	Wave 2 (N = 45) M (SD)	Wave 3 (N = 42) M (SD)	Wave 4 (N = 50) M (SD)
Individual Characteristics[a]	10	37.31 (5.69)	37.29 (5.51)	38.05 (6.65)	36.78 (6.11)
Family Characteristics[b]	19	13.63 (3.47)	12.14 (2.9)	13.33 (5.05)	13.4 (4.65)
Community Characteristics[a]	7	23.26 (4.59)	22.33 (5.5)	22.98 (4.71)	23.06 (5.83)
Peer Influences[c]	10	M26.7 (10.9)	26.49 (10.03)	27.17 (9.5)	26.96 (10.08)
Reflective Processes[a]	5	19.19 (3.61)	18.29 (4.18)	18.83 (3.67)	19.00 (4.25)
Reasons for Life[d]	5	20.96 (5.19)	21.04 (4.74)	21.29 (4.61)	22.42 (4.99)
Community 2					
Scale	Number of items	Wave 1 (N = 74) M (SD)	Wave 2 (N = 74) M (SD)	Wave 3 (N = 59) M (SD)	Wave 4 (N = 47) M (SD)
Individual Characteristics[e]	8	122.55 (29.24)	125.73 (29.46)	125.11 (25.72)	120.15 (27.93)
Family Characteristics[e]	16	235.53 (39.31)	239.74 (51.38)	237.52 (41.83)	241.77 (43.19)
Community Characteristics[e]	6	88.23 (22.76)	88.68 (24.85)	89.20 (21.72)	87.36 (21.47)
Peer Influences[e]	10	120.03 (60.37)	126.56 (64.84)	128.24 (59.85)	121.46 (63.74)
Reflective Processes[e]	5	81.89 (17.70)	81.02 (18.26)	83.12 (16.76)	81.60 (15.90)
Reasons for Life[e]	5	63.56 (16.53)	65.59 (15.35)	64.70 (15.53)	62.98 (17.49)

Scale scores in Community 1 were derived from an analog response format coded on a 5-point interval, and in Community 2, this same analog scale was coded on a 20-point interval; scores were range-standardized scores prior to analyses to address this scaling issue

[a] 5-point Likert-type scale

[b] Yes/no response format binary scale (0.1)

[c] 4-point Likert-type scale

[d] 6-point Likert-type scale

[e] 20-point Likert-type scale

Table 4 Summary of mixed model comparative effectiveness results ($N = 128$)

	Estimate	SE	*df*	*t*	Effect size (Cohen's *d*)
Individual Characteristics					
Time	−0.0006	0.0004	310	−1.35	0.15
Community	−0.0280	0.0178	124	−1.58	−0.28
Protection	0.0510	0.0147	124	3.46	0.59**
Time × community	0.0003	0.0014	310	0.21	0.02
Family Characteristics					
Time	−0.0002	0.0005	310	−0.48	−0.05
Community	0.0131	0.0202	124	0.07	0.11
Protection	0.0666	0.0167	124	3.99	0.67**
Time × community	−0.0007	0.0016	310	−0.44	−0.05
Community Characteristics[a]					
Time	−0.0002	0.0006	183	−0.28	−0.04
Community	−0.0936	0.0234	124	−3.99	−0.67**
Protection	0.1081	0.0185	124	5.83	0.93**
Time × community	0.0002	0.0006	183	0.34	0.05
Peer Influences					
Time	0.00035	0.0013	310	0.26	0.03
Community	−0.0244	0.0468	124	−0.52	−0.09
Protection	−0.0628	0.0383	124	−1.64	−0.29
Time × community	−0.0005	0.0042	310	−0.13	−0.14
Reasons for Life					
Time	−0.0001	0.0005	310	−0.22	−0.03
Community	−0.0385	0.0187	124	2.06	0.36*
Protection	0.0838	0.0154	124	5.42	0.88**
Time × community	0.0040	0.0016	310	2.46	0.27*
Reflective Processes					
Time	−0.0001	0.0005	309	−0.18	−0.02
Community	−0.0610	0.0218	124	−2.80	−0.49**
Protection	0.0419	0.0181	124	2.31	0.41*
Time × community	0.0017	0.0017	309	0.99	0.11

*$p < .05$; **$p < .01$

[a] Community characteristics is based on Waves 2, 3, and 4. Wave 1 Support subscale scores on the Community Characteristics scale were used as a measure of pre-existing protective factors in these analyses

Yup'ik communities and additionally suggests that on average, youth begin to benefit from the intervention following attendance in approximately seven activities.

Addressing suicide and co-occurring alcohol misuse risk is a public health priority of immense proportion for American Indian and Alaska Native communities. There is similar intense interest in "culture as treatment," approaches that use Indigenous traditional knowledge in the development of culturally commensurate, effective intervention strategies (Gone 2012). This study represents, to our knowledge, one of the first efforts in blending perspectives from Western science in an effort to explore effectiveness of a culture as intervention approach.

A second promising element involves the extent of intervention reach with young Alaska Native males, who participated in *Qungasvik* at rates similar to or exceeding females. Young Alaska Native men are at particularly high risk for suicide (Allen et al. 2011). Development of effective intervention strategies for this group constitutes a high services priority. We believe that the successful engagement of young men here results from the intervention development efforts to include types of activities and cultural knowledge that appeal to young men, recruitment of community staff for gender balance, and program efforts to actively seek out, then retain males.

These findings are subject to four important limitations. First, while intervention roll out order was randomly assigned in the DWLD, dose was not the result of random assignment; as a result, interpretations of differences in effects on the community level are complex. Each intervention is influenced

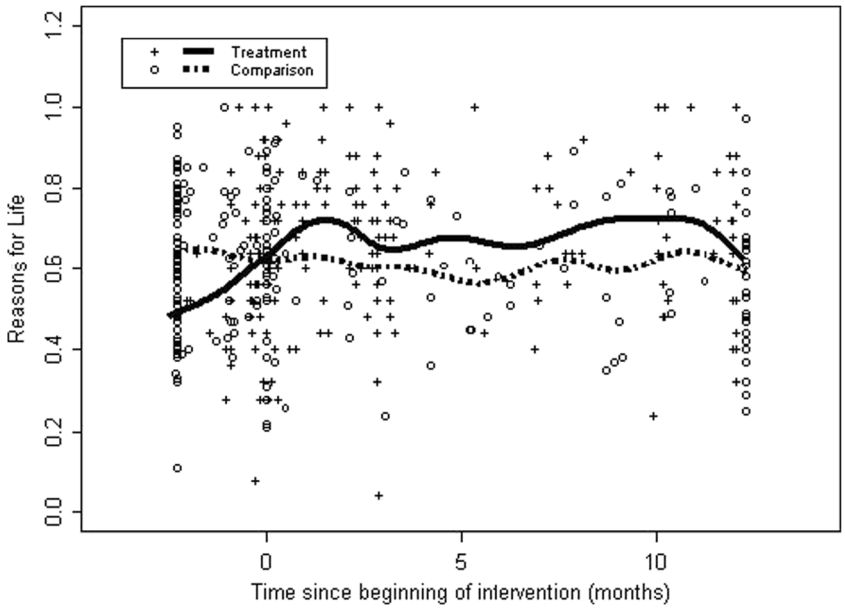

Fig. 2 Estimated Reasons for Life (RL) functions for treatment (Community 1) and comparison (Community 2). *Cross markers* indicate raw treatment RL scores, while *circles* indicate raw comparison RL scores. The *solid curve* represents the estimated function for treatment, while the *dotted curve* indicates comparison. Three data points that were outliers on time in intervention beyond 12.3 months were winsorized to 12.3 months. Drop in the treatment smoothed function curve at 11–12 months is a common functional data analysis artifact when data points are lacking; treatment had few data points available at 11–12 months

by differing community histories of research engagement and other events, including youth suicide. Randomization resulted in Community 2 implementing the intervention immediately following intervention implementation in the most geographically contiguous community in the region. These two communities have close intercommunity relationships, including rivalries from such areas as high school sports to community and extended kinship family histories. In Community 2, this may have hindered local ownership of an intervention model initially developed in Community 1. Community members questioned this intervention roll out order selection given these considerations; however, we adhered to the randomization schedule in our design. A more protracted process of local adaptation in Community 2 than originally envisioned ensued, and at the one year point, start-up had commenced more slowly and dose was lower. The lower intervention intensity in Community 2 at 12 months reflected this organizational work as part of the implementation. Community 2 sustained implementation following the assessment time frame, highlighting the differing time needs noted in the community-level intervention literature (Trickett et al. 2011). Though suicide was no stranger to both study communities, Community 1 was responding to a recent youth suicide cluster, and implementation followed 2 years of sustained engagement as an intervention development community. In contrast, Community 2 had a briefer pre-intervention engagement and no immediate history of cluster suicide. It also had more males enrolled, who are at greater risk as a population, and this may have impacted outcomes.

Second, though this study enrolled a majority of the youth residing in the two participating communities, sample size is small for a universal prevention trial, and several youth changed community residence or were out of the community at an assessment time point, which impacted retention rates. It is possible that some of the observed nonsignificant trends in the data may have proven statistically significant with a larger sample.

Third, measures of Individual and Community Characteristics and of RP in Community 1 displayed limitations in ability to separate individuals according to level on the latent trait, while Peer Influences in Community 2 provided virtually no capability. These measurement issues could result in Type II error, failure to reject a false null hypothesis by not identifying a true intervention effect, rather than producing a false positive finding. One value of this study was in alerting the research team on the need to refine these measures and to replace the Peer Influences measure in our ongoing work with *Qungasvik*.

Finally, there were numerous null findings. While *Qungasvik* aims to promote protection from co-occurring suicide and alcohol risk, significant findings were not observed for alcohol protection, and there were no intermediate outcome differences between communities. However, within community growth occurred for the Individual Characteristics intermediate outcome in Community 1, a proposed mechanism of change variable, but not for other intermediate variables in the model. The negative findings highlight the positive value of these types of incremental small sample studies as part of ongoing larger scale prevention trials. The findings alerted our team to re-examine the alcohol intervention components and to scrutinize fidelity in the alcohol prevention efforts of our ongoing implementation, as well as to enhance family level efforts directed at parents and parenting, and community level activities, in our ongoing implementation.

Important issues surface in asking why did Community 2 produce a lower intensity implementation? Community intervention implementation requires attending to each

community's current level of organizational development. This calls forth more nuanced consideration of the concept of time and of intervention time duration (Allen et al. 2014, Trickett et al. 2014). In some communities, implementation may require a lengthier community development process; time in intervention as a variable and as a level of analysis may be better understood in terms of community position along this developmental process. In fact, we have observed sustained intervention activities, with ongoing elements of direct intervention effects and ripple effects in Community 2, in ways that have expanded our understanding of impact.

This study adopted a comparative effectiveness design in efforts to apply a cultural perspective in evaluation of research risks and benefits, one of four ethical dimensions in culturally sensitive research proposed by Trimble et al. (2010). In their evaluation of risk and benefit, several community representatives expressed discomfort with randomized controlled trials (RCTs). In particular, they observed that withholding a program was inconsistent with Yup'ik cultural values of inclusion; from a community perspective, if an intervention is thought beneficial, why would you randomly withhold it from some? From Yup'ik cultural perspectives, the community is itself one organism; why would you treat half of it? In response, for the larger prevention trial from which this study was drawn, we adopted a DWLD. Two communities at this point in time of our intervention research emerged as implementing at different dose levels. This allowed comparison of one community to another at a point earlier in its intervention process. This approach, a variation of a stepped-wedge design (Henry et al. 2015), avoided a direct comparison of quality of the intervention work across two close-knit communities, because the unit of analysis was intensity of intervention.

How might the field advance by using rigorous designs that allow for better causal inference in these extremely hard-to-reach communities? Health disparities research is often conducted with small population and culturally distinct, difficult to access populations, leading several researchers to argue that small sample studies are essential to health disparities science (Srinivasan et al. 2015; Henry et al. 2015). However, small samples create challenges to effective implementation of the RCT design. Wyman et al. (2015) describe logistical and ethical issues that can arise, and note inefficiencies in how the RCT uses information can result in low power and external validity. They propose the DWLD and regression point displacement design as alternative designs that maintain rigor while optimizing power, and Fok et al. (2015) propose the stepped-wedge design (SWD) and interrupted time-series design. Roll out designs such as the DWLD and SWD allow for the additional element of randomization of intervention start time. By prioritizing optimization in design selection, combined with measurement optimization strategies outlined by Fok and Henry (2015) and additional optimization strategies proposed by Hopkin et al. (2015), studies can more efficiently use available information to maximize power with modest sample size to advance the field. Finally, mixed methods and implementation of Bayesian approaches provide emergent alternatives (Henry et al. 2015).

The current research provides promising findings for the *Qungasvik* intervention and demonstrates the utility of small sample methods to address socially meaningful issues with culturally distinct, small populations in difficult to access settings. More broadly, these findings provide further window into culture as treatment and the promise of intervention approaches making direct use of culture, drawing from the world of local practices grounded in Indigenous traditional knowledge.

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Compliance with Ethical Standards

Conflict of Interest The authors, including the Qungasvik Team, our community research partners, and the estate of David Henry, declare that they have no conflicts of interest.

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Informed Consent All parents gave informed consent before youth participation, and all youth participants gave assent following parent consent.

References

Allen, J., Mohatt, G. V., Rasmus, S. M., Hazel, K., Thomas, L., Lindley, S., & People Awakening Team (2006). The tools to understand: Community as co-researcher on culture specific protective factors for Alaska natives. *Journal of Prevention and Intervention in the Community, 32*, 41–59. doi:10.1300/J005v32n01_04.

Allen, J., Levintova, M., & Mohatt, G. (2011). Suicide and alcohol related disorders in the U.S. Arctic: Boosting research to address a primary determinant of health disparities. *International Journal of Circumpolar Health, 70*, 473–487.

Allen, J., Fok, C. C. T., Henry, D., Skewes, M., & People Awakening Team. (2012). Umyuangcaryaraq "reflecting": Multidimensional assessment of reflective processes about the consequences of alcohol use among Yup'ik Alaska Native youth. *American Journal of Drug and Alcohol Abuse, 38*, 468–475. doi:10.3109/00952990.2012.702169.

Allen, J., Mohatt, G. V., Beehler, S., & Rowe, H. (2014a). People Awakening: Collaborative research with Alaska Native rural communities to address alcohol use disorders and suicide health disparities. *American Journal of Community Psychology, 54*, 100–111. doi:10.1007/s10464-014-9647-1.

Allen, J., Mohatt, G. V., Fok, C. C. T., Henry, D., Burkett, R., & People Awakening Team. (2014b). A protective factors model for alcohol abuse and suicide prevention among Alaska Native youth. *American Journal of Community Psychology, 54*, 125–139. doi:10.1007/S10464-014-9661-3.

Ayunerak, P., Alstrom, D., Moses, C. Charlie, J., & Rasmus, S. M. (2014). Yup'ik culture and context in southwest Alaska: Community member perspectives of tradition, social change, and prevention. *American Journal of Community Psychology, 54*, 91–99.

Barlow, A., Tingey, L., Cwik, M., Goklish, N., Larzelere-Hinton, F., Lee, A., Suttle, R., Mullany, B., & Walkup, J. T. (2012). Understanding the relationship between substance use and self-injury in American Indian youth. *American Journal of Drug and Alcohol Abuse, 38*, 403–408. doi:10.3109/00952990.2012.696757.

Bond, T., & Fox, C. (2007). *Applying the Rasch model: Fundamental measurement in the human sciences* (2nd ed.). Mahwah: LEA.

Clifford, A. C., Doran, C. M., & Tsey, K. (2013). A systematic review of suicide prevention interventions targeting indigenous peoples in Australia, United States, Canada and New Zealand. *BioMed Central Public Health, 13*, 463. doi:10.1186/1471-2458-13-463.

Fienup-Riordan, A. (2000). *Hunting tradition in a changing world: Yup'ik lives in Alaska*. New Brunswick: Rutgers University Press.

Fok, C. C. T., Allen, J., Henry, D., Mohatt, G. V., & People Awakening Team. (2012). The Multicultural Mastery Scale for youth: Multidimensional assessment of culturally mediated coping strategies. *Psychological Assessment, 24*, (2), 313–327. doi:10.1037/a0025505.

Fok, C. C. T., Allen, J., Henry, D., & People Awakening Team. (2014). The Brief Family Relationships Scale: An adaptation of the relationship dimension of the Family Environment Scale. *Assessment, 21*(1), 67–72

Fok, C. C. T., & Henry, D. (2015). Increasing the sensitivity of measures to change. *Prevention Science, 16*, 978–986. doi:10.1007/s11121-015-0545-z.

Fok, C. C. T., Henry, D., & Allen, J. (2015). Research designs for intervention research with small samples II: Stepped wedge and interrupted time-series designs. *Prevention Science, 16*, 967–977. doi:10.1007/s11121-015-0569-4.

Gone, J. P. (2012). Indigenous traditional knowledge and substance abuse treatment outcomes: The problem of efficacy evaluation. *American Journal of Drug and Alcohol Abuse, 38*, 493–497. doi:10.3109/00952990.2012.694528.

Hawkins, E. H., Cummins, L. H., & Marlatt, G. A. (2004). Preventing substance abuse in American Indian and Alaska Native youth: Promising strategies for healthier communities. *Psychological Bulletin, 130*, 304–323. doi:10.1037/0033-2909.130.2.304.

Hedeker, D. G., & Gibbons, R. D. (2006). *Longitudinal data analysis*. Hoboken: Wiley.

Henry, D., Allen, J., Fok, C. C. T., Rasmus, S., Charles, B., & Team, P. A. (2012). Patterns of protective factors in an intervention for the prevention of suicide and alcohol abuse with Yup'ik Alaska Native youth. *American Journal of Drug and Alcohol Abuse, 38*, 476–482. doi:10.3109/00952990.2012.704460.

Henry, D., Fok, C. C. T., & Allen, J. (2015). Why small is too small a term: Prevention science for health disparities, culturally distinct groups, and community-level intervention. *Prevention Science, 16*, 1026–1032. doi:10.1007/s11121-015-0577-4.

Henry, D. B., Tolan, P. H., & Gorman-Smith, D. (2005). Cluster analysis in family psychology research. *Journal of Family Psychology, 19*, 121–132.

Hopkin, C. R., Hoyle, R. H., & Gottfredson, N. C. (2015). Maximizing the yield of small samples in prevention research: A review of general strategies and best practices. *Prevention Science, 16*, 950–955. doi:10.1007/s11121-014-0542-7.

Hull-Jilly, D. M. C. & Casto, L. D. (2013). *State epidemiologic profile on substance use, abuse and dependency–2007-2011*. Alaska Department of Health and Social Services. Retrieved from http://dhss.alaska.gov/dph/Epi/Documents/01-Internal/injury/sa/SubstanceAbuseEpiProfile_2013.pdf.

John, G. & Edison. J. T. (2014) Collaborative measurement development as a tool in CBPR: Measurement development and adaptation within the cultures of communities. *American Journal of Community Psychology, 54,* (1–2):112–124.

Linehan, M. M., Goodstein, A. J., Nielsen, S. L., & Chiles, J. A. (1983). Reasons for staying alive when you are thinking about killing yourself: The Reasons for Living Inventory. *Journal of Consulting and Clinical Psychology, 51*, 276–286. doi:10.1037/0022-006X.51.2.276.

Middlebrook, D. L., LeMaster, P. L., Beals, J., Novins, D. K., & Manson, S. M. (2001). Suicide prevention in American Indian and Alaska Native communities: A critical review of programs. *Suicide and Life Threating Behavior, 31*, 132–149. doi:10.1521/suli.31.1.5.132.24225.

Mohatt, G. V., Fok, C. C. T., Henry, D., People Awakening Team, & Allen, J. (2014). Feasibility of a community intervention for the prevention of suicide and alcohol abuse with Yup'ik Alaska Native youth: The Elluam Tungiinun and Yupiucimta Asvairtuumallerkaa studies. *American Journal of Community Psychology, 54*, 153–169. doi:10.1007/s10464-014-9646-2.

Moos, R. H., & Moos, B. S. (1994). *Family Environment Scale* (3rd ed.). Palo Alto: Consulting Psychologists Press.

Oetting, E. R., & Beauvais, F. (1990). Adolescent drug use: Findings of national and local surveys. *Journal of Consulting and Clinical Psychology, 58*, 385–394. doi:10.1037/0022-006x.58.4.385.

Osman, A., Kopper, B. A., Barrios, F. X., & Osman, J. R. (1996). Brief Reasons for Living Inventory for Adolescents (BRFL-A). *Journal of Abnormal Child Psychology, 24*, 433–443. doi:10.1007/bf01441566.

Paula, A. Deborah, A. Charles, M. James, C. Stacy, M. R. (2014) Yup'ik culture and context in southwest Alaska: community member perspectives of tradition, social change, and prevention. *American Journal of Community Psychology, 54,* (1–2):91–99.

Ramsay, J. O., & Silverman, B. W. (2005). *Functional data analysis* (2nd ed.). New York: Springer.

Rasmus, S. M., Charles, B., & Mohatt, G. V. (2014). Creating Qungasvik (a Yup'ik intervention "toolbox"): Case examples from a community-developed and culturally-driven intervention. *American Journal of Community Psychology, 54*, 140–152. doi:10.1007/s10464-014-9651-5.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models* (2nd ed.). Thousand Oaks: Sage.

Seale, J. P., Shellenberger, S., & Spence, J. (2006). Alcohol problems in Alaska natives: Lessons from the Inuit. *American Indian and Alaska Native Mental Health Research, 13*, 1–31. doi:10.5820/aian.1301.2006.1.

Srinivasan, S., Moser, R. P., Willis, G., Riley, W., Alexander, M., Berrigan, D., & Kobrin, S. (2015). Small is essential: Importance of subpopulation research in cancer control. *American Journal of Public Health, 105*, 371–373. doi:10.2105/ajph.2014.302267.

Trickett, E. J., Beehler, S., Deutsch, C., Green, L. W., Hawe, P., McLeroy, K., et al. (2011). Advancing the science of community-level interventions. *American Journal of Public Health, 101*, 1410–1419. doi:10.2105/Ajph.2010.300113.

Trickett, E.J., Trimble J.E., Allen J. (2014) Most of the story is missing: Advocating for a more complete intervention story. *American Journal of Community Psychology 54,* (1–2):180–186

Trimble, J. E., Scharrón-del Rio, M., & Casillas, D. M. (2010). The itinerant researcher: Ethical and methodological issues in conducting cross-cultural mental health research. In D. C. Jack & A. Ali (Eds.), *Cultural perspectives on women's depression: Self-silencing, psychological distress and recovery* (pp. 73–95). New York: Oxford.

Whitbeck, L. B., Walls, M. L., & Welch, M. L. (2012). Substance abuse prevention in American Indian and Alaska Native communities. *American Journal of Drug and Alcohol Abuse, 38*, 428–435. doi:10.3109/00952990.2012.695416.

Wyman, P. A., Henry, D., Knoblauch, S., & Brown, C. H. (2015). Designs for testing group-based interventions with limited numbers of social units: The dynamic wait-listed and regression point displacement designs. *Prevention Science, 16*, 956–966. doi:10.1007/s11121-014-0535-6.