Longitudinal Patterns of Strengths among Youth with Psychiatric Disorders:

A Latent Profile Transition Analysis

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Abstract

A better understanding of variability in the strengths of youth with psychiatric disorders is critical as a strength-based approach can lead to recovery. This study aimed to identify subgroups of strengths among youth with mental disorders and determine whether subgroups changes were associated with mental health recovery. Youth with mental disorders (N=2,228) from a statewide database were identified in the state fiscal year of 2019. Using the latent profile latent transition analysis, we identified three strength profiles and that their positive transitions were associated with the reduced number of actionable needs. The findings suggest that subgroups of strengths may be a promising source to track youth's progress and guide clinicians to allocate community-based resources more efficiently to improve specific strength areas.

Introduction

About 10–20% of youth worldwide are affected by mental health conditions [1], and one in ten youth, ages between five and 16, are diagnosed with psychiatric disorders [2]. In the United States, depressive symptoms and suicidal behaviors are increasingly common among youth [3, 4]. The estimated costs of childhood mental health conditions are about $10.9 billion each year [5]. In addition, youth mental health conditions are shown to have an association with a wide range of maladjustments and continued disruptions across the lifespan [6-8]. Parents and other family members, health care providers, and educators need to better understand the effects of mental health conditions on youth to prevent destructive consequences for youth and their families.

Human service agencies have traditionally focused interventions on psychological or environmental risk factors such as suicide or substance abuse [9, 10]. McCaskey pointed out that the emphasis on problems or risky behaviors may lead to a cycle of youth dependency on prescribed programs or assigned experts instead of recognizing their unique strengths or resilience [11]. In 2016, although many therapists opted to nurture clients' strengths and problem-solving abilities to buffer against subsequent risk factors in the treatment of adults with mental illness, Mendenhall and Grube argued that current practices for youth consumers' mental illness were limited in integrating personal strengths and difficulties, and rather focusing on a crisis modality [12].

The strength-based approach focuses on the youth's unique strengths instead of weaknesses by collaborating with their families and communities to enhance motivation to change and improve psychosocial functioning [13, 14]. A strength-based approach is also viewed as less stigmatizing for youth than deficits models [13]. In addition, the strength-based approach

integrates interpersonal [15] and community resources [16]. In 2014, Rapp and Sullivan [17] identified six critical components of the strength-based approach as follow: (1) The client who experiences problems has the capacity to grow; (2) the clinician needs to move beyond deficits and emphasizes strengths; (3) the client focuses on the contexts and its natural resources; (4) the client is the actor of his/her treatment (i.e., setting own goals); (5) the relationship between the therapist and client is critical to foster hope; and (6) if possible, the client should be placed in the natural environment or the community setting.

The outcomes of strength-based interventions are multidimensional, including family strength development [18], interpersonal relationships [19], optimism [20], spirituality [21], self-esteem [22], talent/interests, educational, vocational, permanent relationships [23], care involvement, natural supports, and community involvement [24].

However, much of the research on strengths has focused on a single or limited number of strengths. Traditionally, many resilience studies have examined how a single protective factor buffers a negative outcome through a moderation model [25]. One recent resilience study, for example, emphasizes the multi-levels of children's ecologies, such as families and communities, promote positive outcomes based on developmental [26] and social-ecological [27] approaches. However, research exploring the possible strengths of children at multiple levels is lacking [28]. There are limited person-centered studies in youth's strengths [29], especially youth with mental health issues, and to what extent these psychosocial factors would predict changes in strength profiles over time.

A person-centered analysis will allow us to find a distinct unobserved group of youth who share similar attributes that may be associated with different predictors and/or outcomes. It is also a powerful tool to explore developmental heterogeneity in the target population [30].

There are multiple studies using latent class analysis [31, 32], but most of them are cross-sectional studies. Very few studies, to date, have been conducted on identifying patterns of strengths, classifying similar groups, and/or tracking them in the latent classes [29]. Few studies indicated to what extent psychosocial factors predicted movement between different strength groups and expanded the person-centered analysis to a longitudinal level, such as latent transitional analysis, to see how those classes change over time. Addressing the limitations in earlier studies, this study aims (1) to identify unobserved subgroups in a youth population ending behavior health treatment, (2) to examine profiles of youth strengths that move into categories that are more/less useable, (3) to determine whether patterns in transitions among youth strengths' classes are the same across the periods, and (4) to predict the number of actionable problems that interfere with functioning based on different transitions.

Methods

Data source and study sample

We used statewide administrative data from Indiana that provided an integrated system of information, including demographic, diagnostic, assessment, and treatment service information. Since 2007, this database has supported the utilization of person-level information about the strengths and needs of individuals with mental health and substance use disorders in data-driven decisions and outcome-oriented case management. In this study, participants included 2,228 children and youth aged 13-20 who completed an episode of publicly funded mental health services during the state fiscal year 2019. Retrieved data included initial and most recent assessment data, regardless of whether the clients began services before 2019.

This study was deemed to be exempt from human participants review by the researchers'

university institutional review board (#1911059765). Study procedures followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline [33].

Measures

Key outcomes of interest for youth with psychiatric disorders were explored. Functional outcome measures were identified through the Child and Adolescent Needs and Strengths (CANS) [34]. First developed based on the Childhood Severity of Psychiatric Illness, the CANS was expanded to support decision-making and recovery planning. Since 2007, in Indiana, the CANS has been utilized in the behavioral health and child welfare systems to inform direct care, program, and system decisions and to monitor progress via six-month reassessments. Based on the patterns of needs, the state's mental health database calculates algorithms to inform the intensity of care decisions and supports individual and aggregated progress reports.

CANS domains included one strength-related domain and five need-related domains (i.e., life functioning, cultural factors, caregiver needs and resources, child behavioral or emotional needs, and risk behaviors). These measures are used reliably to assess the severity of needs and build strengths among children with psychiatric disorders [35]. The strength domain included 12 items (i.e., family strengths, interpersonal, optimism, educational, vocational, talents/interests, spiritual/religious, community life, relationship permanence, youth involvement with care, natural supports, and resilience). Resilience, which has been collected in the last two years, was omitted due to missing data. Each strength item was rated on a four-point scale: 0 (strength in place that is essential in planning); 1 (strength that can be used in planning); 2 (identified strength that must be built); or 3 (no strength identified). Youth needs (on behavioral/emotional, risk behaviors, and functioning domains) were rated on a four-point scale: 0 (no evidence of a

need); 1 (significant history or need not impacting functioning); 2 (need that interferes with functioning; action required); or 3 (dangerous or disabling need; immediate/intensive action indicated).

This study focused on the strength domain's items to identify latent classes and the number of actionable needs' items. For this study, an average rating in the strength domain close to 0 was classified as an essential strength in place group, 1 for a usable strengths group, and 2 for a buildable strength group. Similarly, youth need items (i.e., behavioral/emotional, risk behaviors, and functioning domains) with scores of 2 or 3 were recoded as actionable needs items [34].

Service providers completed and maintained online training and certification to utilize the CANS tool. The state's database monitored test reliability and only accepted assessment ratings from a clinician with current test reliability of 0.70 or higher, using an intra-class correlation coefficient. Local coaches and/or supervisors received additional training to support implementation. In the state fiscal year of 2019, the statewide mean test reliability for agencies contracting with the state mental health and addiction authority was 0.82.

A Rasch scaling analysis of the CANS demonstrated that the Strength domain was a separate construct from youth needs (behavioral/emotional, life functioning, and risk behaviors) and the caregiver domain due to different constructs and action levels [34]. The Rasch model's strength domain separation statistic was 1.81, translating to Cronbach's alpha of 0.77 approximately. For youth needs domains, the Rasch separation statistic of 1.98, which is similar to a Cronbach's alpha of 0.80, suggesting a feasible measure of overall functioning [34]. Demographic information about youth included age, gender, race (e.g., white, black, Native American), ICD-9 or ICD-10 psychiatric disorders, services use (i.e., a continuum of care for

youth with psychiatric disorders), receipt of Medicaid insurance, the number of days in treatment, and the number actionable needs items [36].

Analysis

Latent profile analysis (LPA) was first administered to identify unobserved subgroups among youth with psychiatric disorders. CANS strength items were placed in the core for the development of a strength-based approach that supports the belief that youth and families have unique family strengths, interpersonal skills, talents, and lifestyles that help them to meet recovery goals [37]. To determine the fit of the LPA models, multiple indices, such as log-likelihood value, Akaike information criterion (AIC) [38], Bayesian information criterion (BIC) [39], Adjusted BIC (ABIC) [40], Entropy, and the Lo, Mendell, and Rubin likelihood ratio test (LRT) [41], were performed. These indices were compared across one through five classes where the lowest value on each index indicates the best model fit. For a given entropy estimate, its value approaching 0.80 was considered as the best model fit when LRT showed significance. Finally, the number of classes for the study was determined by evaluating overall indices.

In this regard, we analyzed youth strengths at the beginning of the service (first assessment) and the end of the service (last assessment) among youth's episodes of care closed in 2019 via LPA, respectively, and examined tenability and trajectories of different latent classes at the end of an episode via latent transition analysis (LTA). The LTA model, in particular, presented the size of different classes and their movements over time. We examined the initial membership assumption. The primary parameters of interest in the LTA model were transition probabilities based on the estimated model, which, for example, were the likelihood of a participant who belonged to a strength in place group at the beginning of the service and shifted

to strength in place, usable, or buildable strength at the end of the service. And a linear

regression with dummy coding was applied to predict the number of actionable needs items by

latent classes' transition. Missing data were handled using a listwise deletion technique. All the

analysis was conducted using SPSS 26 and Mplus Version 7.

Results

Socio-demographic characteristics of the study sample

The mean age of the study sample was 16 (standard deviation [SD], 1.6). Youth in this

study sample, on average, were in treatment for 547.6 days (SD, 569.5) and had 12.9 actionable

items identified at the beginning of the service (SD, 6.82). About 53% were female, and youth's

race reflected the state's population (77.3% White, 12.7% Black, 5.7% other single race, 0.4%

Native American, and 3.5% more than one race) (**Table 1**). The most common psychiatric

disorders included major depressive disorder (27.1%), conduct disorders (14.5%), attention-

deficit hyperactivity disorder (11.6%), and anxiety disorders (11.3%). Based on patterns of

CANS needs ratings, the majority level of care recommendation was the supportive community-

based services (51.9%) in the state fiscal year of 2019. Most youth (82.5%) were covered by

Medicaid.

LPA analyses

Results from LPA with three latent classes at Time 1 present AIC, BIC, and ABIS

decreased as the number of classes increased and Entropy for the 3-class model was .73, which

was generally considered reasonable (see Table 2). LRT was also indicated that the 3-class

model was significantly different from the 2-class model. After comparing these model fit

indices, the 3-class model was selected for Time 1 as the best-fitting model that was also easily interpretable.

These LPA results indicated that three strength profiles emerged at the beginning of the service with the best model fit indices: strength in place group (18.5.0%), a useable strength group (47.1%), and a buildable strength class (34.4%) presented in **Figure 1a**.

At the exit of the mental health service, the three-class model was also selected: strength in place (20.4%), useable (49.8%), and buildable strength (29.8%), presented in **Figure 1b**.

LTA and analyses

A youth's most likely class membership can be identified based on LTA (**Figure 2**). These probabilities described movement between the three strength classes. 76.6% of youth in the "strength in place" class at the beginning of the mental health service remained in the same class at the end of service. However, 62.6% of youth in the buildable strength stayed in the same class at the end of the service.

We ran a linear regression model to predict the number of actionable items based on latent class transitions with dummy coding to represent negative to positive (NP), positive to negative (PN), remaining in negative (NN), and remaining in positive (PP). A significant regression equation was found, where $F(3,2196)=189.769$ and $p<0.001$ with an R^2 of 0.21. Latent classes' predicted number of actionable items is equal to 9.795, 15.167, 15.738, and 7.661 for NP, PN, NN, and PP, respectively.

Discussion

This is the first study to explore strength profiles and examine the transition of latent

strength profiles among youth with serious mental health problems using statewide administrative claims data. We found substantial variation across subgroups and across strengths items in that three unobserved subgroups in the beginning and end of the mental health services varied over time. Youth strength profiles transitioned into many positive subgroups. When they belonged to either the "strength in place" or a "buildable strength" group at the beginning of the service, youth remained in the same positive subgroups at the end of the service. Specifically, 93.3% and 94.1% of youth stayed or developed strengths over time, especially when they belonged to strength in place and usable strength groups at the baseline, respectively. For youth in the "buildable strength" class at the beginning of the service, 33% and 4.4% moved to "strength in place" and "usable strength" at the end of services.

Latent classes' transitions and their positive associations with the reduced number of actionable items were consistent with the study findings of youth strengths. Building strengths, a strength-based approach supports youth's personal recovery independent of improving youth mental health needs [24, 42, 43]. Results indicated that transitioning to a better group was associated with a lower number of actionable items at the end of an episode of treatment.

Progress is not always linear. The negative transition highlights the need for proactive services for youth with relatively low risk at the initial assessment because, as youth and families are engaged in treatment, more actionable needs should be identified over time [36]. The result may inform that prevention and intervention efforts should be made, not only for youth at high risk but also for youth with relatively low risk from the beginning of the mental health recovery. It is also important to note that the positive transitions were associated with mental health recovery, including symptom reduction and personal recovery while living with mental health challenges [37].

Previous studies [44-46] provided additional evidence for parents' and adolescents' mutual influences in negative and positive effects over time that resulted in the dynamics of latent classes. Thus, our study supports that the youth and family are active agents in their development and stresses the need to develop services based on a systematic framework that involves the interconnected networks of children's surroundings, which is also in line with Bronfenbrenner's ecological theory [47]. For example, strengthening youths' environments, such as relationships with family members, peers, and neighbors and community involvement, can play critical roles in improving mental health treatment effectiveness.

In this regard, findings suggest that subgroups of strengths may be a promising source to track youth's progress and guide healthcare professionals and behavioral health stakeholders to allocate community-based resources more efficiently to improve specific strength areas. The study supports utilizing essential and other usable strengths to help address youth needs and developing emerging strengths to become useful in supporting youth's development, well-being, and addressing actionable social, emotional, and functional needs and risk behavior. Thus, identified strengths could be embedded into the action plan for mental health recovery.

Furthermore, additional research is needed to explore the relationships among related interventions, subgroup changes, and the impact on youth needs and related outcomes. For instance, a list of youth strengths could be examined separately and collectively that can lead to better outcomes in the mental health recovery in that education and talents/interests were located relatively better position at Time 2 than in Time 1. Examinations of the effect of covariates (i.e., age, gender, race/ethnicity, and duration of treatment) on observed transitions and mediation effects of needs by developing usable strengths are also required to estimate the associations by covariate, needs' item, and class membership.

Despite the promising findings of our strength-based analyses, several limitations deserve comment. First, this study utilized the secondary administrative claims data, which may not capture adequate confounding factors (e.g., parental histories). Other statewide database systems, like education, child protection, and juvenile court systems, could be linked to replicate the current study, controlling for other covariates. Second, the findings are specific to one Midwestern state, and therefore, the results may not be generalizable in other states.

Overall, our research findings suggest that the latent transition analysis provided practically significant insight into longitudinal trends of the strengths among youth with psychiatric disorders. Youth's strengths can be consistently identified. Tracking youth's progress can be an important source to guide healthcare providers, behavioral health stakeholders, and policymakers to allocate community-based resources more efficiently to improve specific strength areas. Furthermore, identified strengths and their utilization can also be used to measure service efficacy to enhance service accountability to improve outcomes in the mental health recovery process.

Summary

In summary, our research findings suggest that the latent transition analysis provided practically significant insight into longitudinal trends of the strengths among youth with psychiatric disorders. Youth's strengths can be consistently identified, and tracking youth's progress can be an important source to guide healthcare providers, behavioral health stakeholders, and policymakers to allocate community-based resources more efficiently to improve specific strength areas. Furthermore, identified strengths and their utilization can also be used to measure service efficacy to enhance service accountability to predict outcomes in the mental health recovery process.

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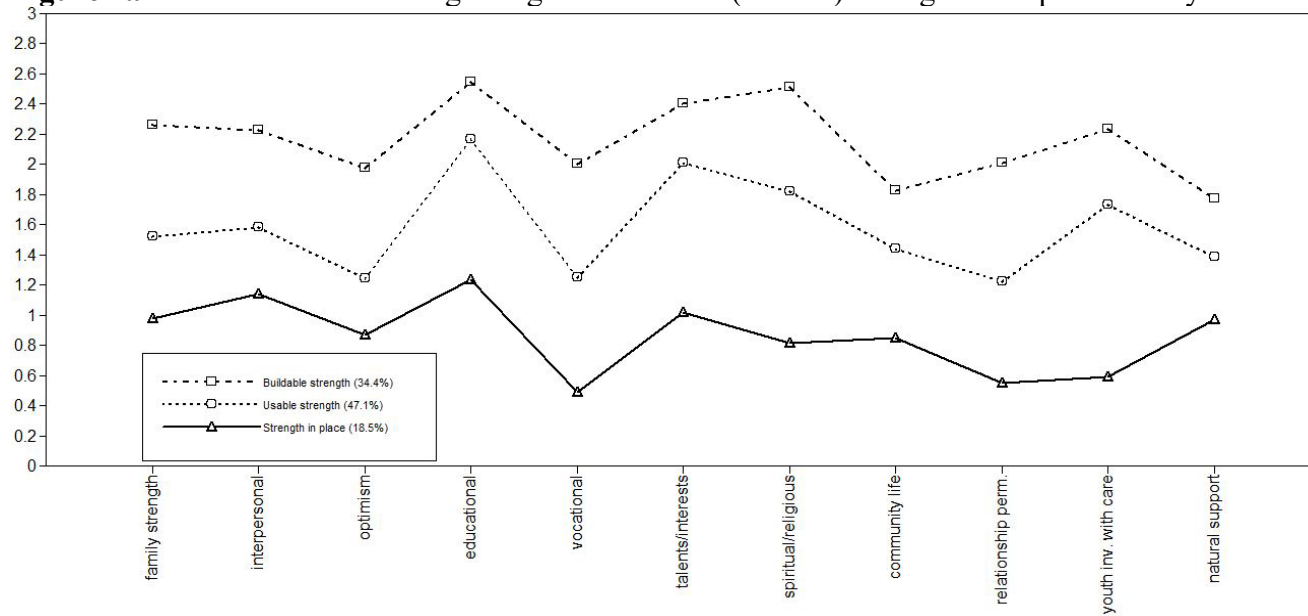
Table 1. Demographic information (N=2,228)

		N	%		
Gender	Female	1169	52.5		
	Male	1053	47.3		
	Other	6	0.2		
Race	Native American	10	0.4		
	Black	282	12.7		
	White	1723	77.3		
	Other single race	127	5.7		
	More than one racial group	77	3.5		
	Missing	9	0.4		
Diagnosis	Attention-deficit hyperactivity disorders	258	11.6		
	Bipolar affective disorder	20	0.9		
	Conduct disorders	322	14.5		
	Cyclothymic disorder	132	5.9		
	Major depressive disorder, recurrent	363	16.3		
	Major depressive disorder, single episode	240	10.8		
	Other anxiety disorders	252	11.3		
	Phobic anxiety disorders	13	0.6		
	Reaction to severe stress, and adjustment disorders	347	15.6		
	Other	65	2.9		
	Missing	216	9.7		
Level of care recommendation	No Recommendation	1	0.0		
	Outpatient	109	4.9		
	Outpatient with occasional case management	353	15.8		
	Supportive community-based services	1156	51.9		
	Intensive community-based treatment and support	315	14.1		
	Community-based assertive community treatment	156	7.0		
	High intensity services	125	5.6		
	Missing	13	0.6		
Medicaid	Yes	1838	82.5		
	No	390	17.5		
		Mean	**SD**	**Min**	**Max**
Age		16.1	1.6	13	20
Length of Stay		547.6	569.5	90	4242
Number of actionable items		12.92	6.82	0	39

Table 2. Latent class fit indices of strengths among youth with psychiatric disorders (N=2,228)
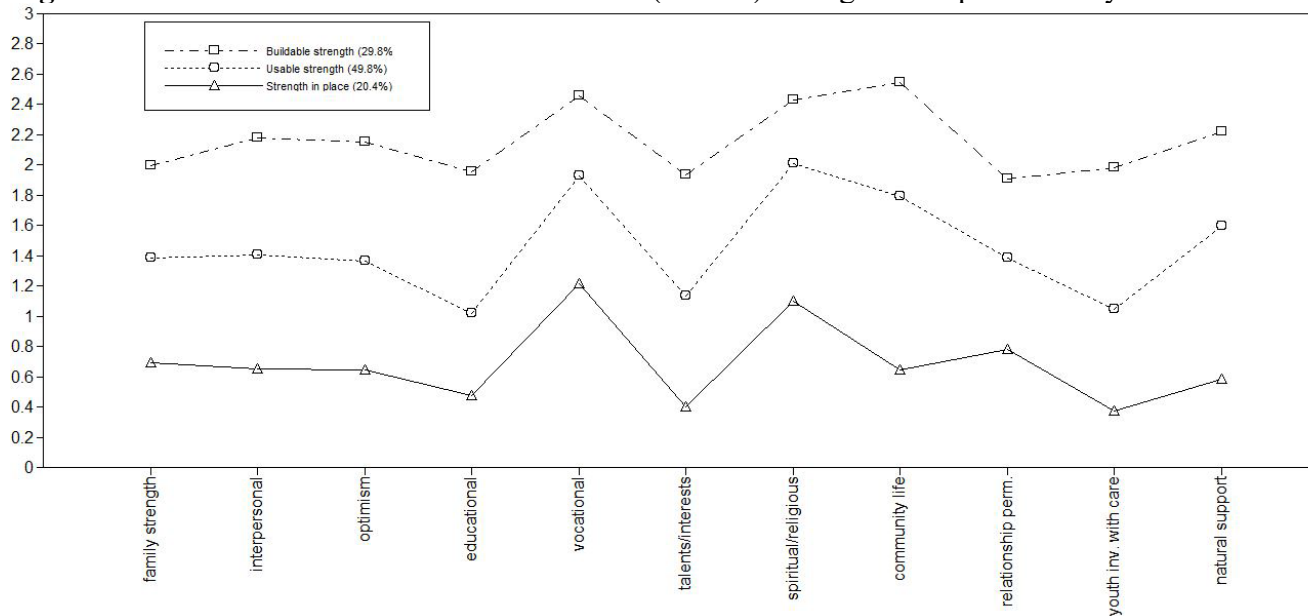
	# of latent classes				
	1	2	3	4	5
# of parameters	22	34	46	58	70
Initial assessment					
Log likelihood	-16458.23	-15621.35	-15454.06	-15367.55	-15305.43
AIC	32960.47	31310.71	31000.11	30851.09	30750.86
BIC	33070.81	31481.24	31230.83	31142.00	31101.96
ABIC	33000.94	31373.25	31084.72	30957.78	30879.62
Entropy		0.79	0.73	0.74	0.81
LRT		1654.113**	330.671**	170.99	111.23
Last assessment					
Log likelihood	-33163.81	-30831.99	-30245.72	-30093.21	-29872.32
AIC	66371.62	61731.99	60583.44	60302.42	59884.63
BIC	66497.22	61926.09	60846.05	60302.42	60284.25
ABIC	66427.32	61818.07	60699.90	60449.26	60061.85
Entropy		0.82	0.79	0.75	0.82
LRT		4613.762**	1160.005**	301.758*	437.065**

Note: *$p < 0.05$, **$p < 0.01$.

Figure 1a. Three classes at the beginning of the service (Time 1) through latent profile analysis

Legend:
- Buildable strength (34.4%)
- Usable strength (47.1%)
- Strength in place (18.5%)

X-axis categories: family strength, interpersonal, optimism, educational, vocational, talents/interests, spiritual/religious, community life, relationship perm., youth inv. with care, natural support

Figure 1b. Three classes at the end of the service (Time 2) through latent profile analysis

Legend:
- Buildable strength (29.8%)
- Usable strength (49.8%)
- Strength in place (20.4%)

X-axis categories: family strength, interpersonal, optimism, educational, vocational, talents/interests, spiritual/religious, community life, relationship perm., youth inv. with care, natural support

Figure 2. Final class counts for the latent class transitional patterns
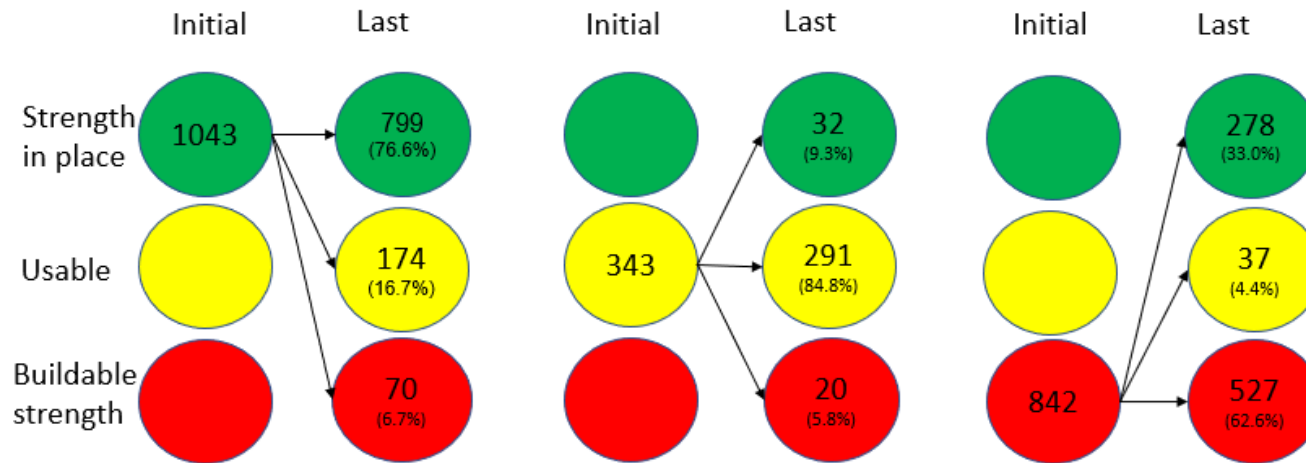
Note: Numbers in circles refer to the number of youth in each class.