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Change in suicidal ideation and associated factors among young adults in Hong Kong from 2018 to 2019: a latent transition analysis

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Abstract

Purpose Suicide in young adulthood is a vital public health concern. There have been few systematic studies that examined the prevalence and transition of suicidal ideation classes in young adults and the factors associated with the transition.
Methods This two-wave survey recruited 1269 young adults (Mean age = 24.0 years, 70.1% males) in Hong Kong. The participants completed the Suicidal Ideation Attributes Scale, Chinese Health Questionnaire, and help-seeking behaviors in 2018 and 2019. Latent profile analysis was used to classify the participants into latent classes of suicidal ideation with substantive checking under the 3-step approach. Latent transition analysis with measurement invariance examined the transition among the latent classes from 2018 to 2019 and the associations with help-seeking behaviors and change in psychological distress.
Results Three latent classes of suicidal ideation were identified and over two-thirds of the participants belonged to the Low-risk class with minimal suicidal ideation. The prevalence of the High-risk class dropped from 10.2 to 7.2%, while that of the Moderate-risk class remained stable from 2018 to 2019. Increases in psychological distress predicted higher probabilities to remain at or transit into more risky classes. Engagement in help-seeking behaviors showed differential transitions in suicidal ideation across time.
Conclusion The findings suggest three latent classes of suicidal ideation with distinct profiles among the young adults. Deterioration in psychological distress showed a temporal effect on worsening of suicidal ideation over a 1-year period. Future studies should elucidate the comparative effectiveness of help-seeking behaviors via online and offline channels.

Keywords Help-seeking behaviors · Latent class · Person-centered approach · Psychological distress · SIDAS

Introduction

Suicide remains a significant public health issue in countries worldwide [1, 2]. Increasing rates of deliberate self-harm have been found among young adults from 2007 to 2016 [3] and non-fatal self-harm has been linked with higher suicide rates and increased suicidal behavior [4]. In Hong Kong, the suicide rate was 14.2 per 100,000 in 2015 with a higher suicide rate for males than females [5] and a local study among 997 adults found a prevalence of 30.9% for lifetime suicidal ideation [6]. Despite a steady increase in the suicide rate along with age, suicide constitutes the fourth leading cause of death among young adults aged between 18 and 29 years in 2019 [7]. Suicide in young adulthood (aged between 18 and 35 years old) is a global challenge with enormous long-term impacts which requires empirical research for in-depth knowledge to mitigate the problem.

Based on the theoretical foundation of the ideation-to-action framework [8], the Interpersonal Theory of Suicide

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[9] identifies distinct phases of suicidal ideation. This theory proposes that development of suicidal ideation results from experiences of perceived burdensomeness and thwarted belongingness and an individual's capability for suicide is essential to progress from ideation to action [10]. A meta-analytic study [11] has provided support for this specific ideation-to-action framework. Suicidal ideation is a necessary condition for a suicide to occur [12] and development and escalation of suicidal ideation is a crucial intermediate step in the transition toward suicide attempts [13].

Latent class analysis and latent profile analysis are person-centered analytic techniques that focus on identifying latent subgroups within a sample based on a certain set of variables [14]. The person-centered approach differs from conventional variable-centered approach, such as factor analysis, in that the former allows finer-grained details on the potential heterogeneity in the sample [15]. Previous studies [16, 17] conducted latent class analysis to classify participants into latent classes of suicidal ideation in empirical samples. However, latent class analysis was cross sectional in nature and could not examine the temporal change in suicidal ideation.

Latent transition analysis (LTA) is a longitudinal analytic technique that estimates the prevalence and transition among latent classes across time [18]. This approach is useful for modeling the transition among the latent classes while allowing for likely misclassification errors and associated factors [19]. Although LTA has been applied in research on substance use and depression [20, 21], previous studies [6, 22] have not applied LTA to investigate transition in suicidal ideation across time. In view of this research gap, the first objective of the present study was to apply LTA to evaluate the latent classes of suicidal ideation and examine the stability and transition among young adults in Hong Kong over one year.

Existing literature has pointed to various risk factors for suicide, such as stressful life events [23], isolation and loneliness [24], substance abuse [25], and psychological distress [26]. A meta-analysis of 50 years of research on suicidality [27] suggests that previous studies on risk factors are homogeneous and there have been mixed findings on the temporal associations between psychological distress and suicidal ideation [28, 29]. The existing studies fail to provide valuable information that predicts in what conditions a young adult will transit from distress to suicidal ideation. This calls for further studies to examine the change in suicidal ideation and the temporal association with psychological distress. The second objective of this study was to investigate the associations between transition in suicidal ideation and changes in psychological distress. We hypothesized changes in psychological distress would be significantly associated with transition toward higher suicidal risks.

Help-seeking behavior is a known protective factor among young adults with suicidal ideation [30, 31] and can be categorized into formal and informal help offered via offline or online channels. Presence of perceived mental health stigma among the young adults [32–34] makes it difficult for helping professionals to engage with this subpopulation. Although formal help is more effective for those with high suicidal ideation, young adults who have suicidal thoughts tend to seek informal help over formal help. Recent studies [35–37] have explored the feasibility of online help-seeking via the internet. These possibilities call for an evaluation on the comparative effectiveness of various help-seeking behaviors across informal/formal sources [38, 39] and offline/online channels [40, 41]. In view of this, the third objective of this study was to compare the transition pattern in suicidal ideation among individuals with different help-seeking behaviors.

Materials and methods

Study design and procedures

The study sample originated from an online survey of a youth emotional support (Open Up) project for the young people [42]. Two waves of data were collected in the survey in 2018 and 2019. With reference to previous literature [43–45], young adulthood referred to the age range of 18–35 years old in the present study. The inclusion criteria were young adults who were aged between 18 and 35 years old, resided in Hong Kong, and could understand written Chinese. The study participants were recruited through different platforms: bulk emails to staff and students of the local universities, poster displays to three non-governmental organizations, and online promotion means, such as webpage and Facebook. Ethical approval was obtained from the Human Research Ethics Committee of the University of Hong Kong prior to the start of the study (Reference number: EA1709039).

The participants provided voluntary informed consent before completing a self-report online questionnaire on suicidal ideation, mental well-being, and help-seeking behaviors. The questionnaire took about 10 min to complete. All participants were eligible to enter a lucky draw for a tablet that was worth approximately 3000 Hong Kong dollar (USD$385) after survey completion in each wave. Participation in the survey was entirely voluntary and all of the information provided by the respondents was kept strictly confidential. Contact details of emotional support hotline and online support services were provided upon the completion of the survey as references for the participants to seek help in case they felt distressed.

Participants

The first wave of the online survey was completed by 1352 participants from January to July 2018. A total of 83 participants were aged below 18 years old and were excluded in the present study, resulting in a final sample of 1269 young adults for subsequent data analysis. More than half of the sample were males (70.1%) and aged between 18 and 24 years old (60.4%). The mean age of the sample was 24.0 years (SD = 4.8). The majority of the participants attained post-secondary education levels (86.3%), such as higher diploma, associate and undergraduate degrees, and were students currently (74.2%). The demographic questions were taken from a previously validated survey among young people in Hong Kong [46]. Pilot testing of the questionnaire was conducted in a small group of 20 undergraduates in a local university to ensure the acceptability and appropriateness of the questionnaire. A total of 822 respondents completed the self-report questionnaire on suicidal ideation and mental well-being at the follow-up assessment from July 2019 to October 2019.

Measures

The present study adopted the Suicidal Ideation Attributes Scale (SIDAS) [47] as a brief assessment of the severity of suicidal ideation in 2018 and 2019. This 5-item instrument measures the frequency of suicide thoughts, uncontrollability of the thoughts, closeness to suicide attempt, distress brought by the thoughts, and their interference on daily activities of the participants over the past four weeks. The five items are rated on an 11-point (0–10) anchored format and summed to produce the total score (theoretical range = 0–50) with higher scores indicating greater ideation. The original developers [47] suggested the following cutoff scores for classification into three categories: No ideation (total score = 0), Low ideation (total score = 1–20), and High ideation (total score = 21–50). The SIDAS has demonstrated good validity and reliability in samples of Australian adults and Chinese young adults [48]. Good levels of internal consistency were found in the present study (α = 0.84–0.90).

Psychological distress was measured in 2018 and 2019 by the Chinese Health Questionnaire (CHQ) [49]. This 12-item scale was developed from the General Health Questionnaire [50] for screening of minor psychiatric morbidity. The CHQ integrates items on somatization and assesses the occurrence of mental health symptoms, such as headache, insomnia, loss of confidence, and hopelessness over the past four weeks. Items are rated on a 4-point Likert format from 0 ("Not at all") to 3 ("Much more than usual"). The total CHQ score had a theoretical range from 0 to 36 with higher scores denoting greater severity. Good levels of internal consistency were found for the CHQ (α = 0.88–0.89) in the present study.

The participants were asked about their help-seeking behaviors over the past four weeks as a result of distressing issues or life difficulties. Engagement in help-seeking behaviors was inquired in the following ten sources under the four categories: offline informal (family members, friends/classmates/colleagues, and partner), offline formal (guidance teachers, medical professionals, such as doctors/nurses, social workers/counsellors, religious personnel, such as priests/pastors), online informal (online friends), and online formal (hotline support and online social service). Regarding the offline formal help, counseling is provided in secondary schools in Hong Kong under the comprehensive guidance and counseling programs and the guidance teachers have received specific trainings on addressing mental health issues. The religious personnel have attended relevant trainings of counseling help in the bible seminary. The participants could theoretically have sought help from more than one of the sources or have not sought help from any of the sources.

Data analyses

Participants' responses on suicidal ideation in 2018 and 2019 were analyzed under both the variable-centered and person-centered approaches. In the variable-centered approach, the five SIDAS items were analyzed by confirmatory factor analysis (CFA) under robust maximum likelihood estimator. Model fit was evaluated using the following criteria on approximate fit indices [51]: comparative fit index (CFI) $\geq$ 0.95 and root-mean-square error of approximation (RMSEA) $\leq$ 0.06.

In the person-centered approach, latent profile analysis (LPA) was performed to identify underlying classes of suicidal ideation separately in 2018 and 2019. LPA is a variant of latent class analysis for the continuous indicators of SIDAS items in the present study [52]. LPA models with increasing number of latent classes were estimated in Mplus 8.4 [53]. Model fit was evaluated using the Bayesian information criterion (BIC) [54] with a lower value of at least 10 denoting a better fit. Item means plot describes the profiles of the latent classes and entropy represents the classification quality of the model with high values (> 0.8) denoting adequate classification. The number of latent classes in the sample was determined based on the BIC, entropy, and substantive checking. Substantive checking of the latent classes [55] was performed with reference to demographic characteristics, psychological distress, and help-seeking behaviors as auxiliary variables under the 3-step approach [56]. Follow-up post hoc tests examined the pairwise comparisons between latent classes with Bonferroni adjustment.

Latent transition analysis (LTA) was then conducted to evaluate the change in the class prevalence and transition probabilities among the latent classes from 2018 to 2019 [57]. The assumption of measurement invariance in LTA was tested by comparing models with and without equal constraints on the item means. Longitudinal measurement invariance preserves the same item means for the latent classes over time and permits a straightforward interpretation of the transition probabilities [19]. Parsimony of the LTA models was compared to the longitudinal CFA models in terms of BIC. The matrix of transition probabilities depicts how likely a participant would shift from one class in 2018 to another class in 2019 or remain in the same class over time.

Potential effects of demographic covariates (age, gender, education level, and student status) on transitions in suicidal ideation were tested in the LTA model. Transition probabilities in suicidal ideation were examined separately across gender (males and females) and age groups (18–24 years old and 25–35 years old). Change in psychological distress was used to predict the transitions in suicidal ideation classes after controlling for baseline distress in the LTA model. The effects were evaluated in terms of the transition probabilities and the odds ratios (OR). Transition in suicidal ideation was analyzed with reference to the help-seeking behaviors by estimating the baseline prevalence and transition probabilities for at-risk participants with different help-seeking behaviors. Missing data were handled via the use of full-information maximum likelihood under the missing at random assumption [58].

Results

Latent profiles of suicidal ideation

The 1-factor CFA model provided an adequate fit to the 2018 data ($\chi^2 = 14.4$, df = 5, $p = 0.01$, CFI = 0.99, and RMSEA = 0.038). All five items had strong loadings ($\lambda = 0.70$–0.91, $p < 0.01$) on the overall factor. Similar model fit was found for the 1-factor CFA model ($\chi^2 = 18.5$, df = 5, $p < 0.01$, CFI = 0.977, and RMSEA = 0.057) in the follow-up data in 2019 with significant factor loadings ($\lambda = 0.40$–0.90, $p < 0.01$). These results supported a 1-factor structure for suicidal ideation in the SIDAS.

The 1-class and 2-class LPA models provided inferior fits to the 2018 and 2019 data than the 1-factor CFA model with substantially higher BICs (Table 1). The 3-class LPA model provided a substantially lower BIC than the CFA model and 2-class LPA model in both 2018 and 2019 with high entropy (> 0.90). In the 3-class LPA model, over two-thirds (68.4%) of the sample belonged to the Low-risk class who showed minimal levels of suicidal ideation (item means < 0.7 out of

Table 1 Fit indices of the CFA, LPA, and LTA models for suicidal ideation in 2018 and 2019

Model	#	loglikelihood	AIC	BIC	Entropy
2018: ($N = 1269$)					
1-factor CFA	15	− 12,724.3	25,479	25,556	–
1-class LPA	10	− 14,577.8	29,176	29,227	–
2-class LPA	16	− 12,857.9	25,748	25,830	0.958
3-class LPA	22	− 12,343.9	24,732	24,845	0.935
4-class LPA	28	− 12,036.6	24,129	24,273	0.961
2019: ($N = 822$)					
1-factor CFA	15	− 7676.8	15,384	15,454	–
1-class LPA	10	− 8735.0	17,490	17,537	–
2-class LPA	16	− 7689.4	15,411	15,486	0.968
3-class LPA	22	− 7314.9	14,674	14,778	0.968
4-class LPA	28	− 6989.1	14,034	14,166	0.974
2018–2019: ($N = 1269$)					
1-factor CFA without MI	36	− 20,200.0	40,472	40,657	–
1-factor CFA with MI	28	− 20,244.4	40,544	40,689	–
3–3 class LTA without MI	48	− 19,592.7	39,282	39,529	0.843
3–3 class LTA with MI	33	− 19,649.6	39,365	39,535	0.850

CFA confirmatory factor analysis, *LPA* latent profile analysis, *LTA* latent transition analysis, *#* number of free parameters, *AIC* Akaike information criterion, *BIC* Bayesian information criterion, *MI* measurement invariance

the 0–10 scale) across the five SIDAS items on frequency, uncontrollability, associated distress, and interference of suicidal thoughts, and closeness to suicide attempt. In Fig. 1, around one-fourth (22.1%) of the sample were classified into the Moderate-risk class with non-trivial degrees of suicidal ideation (item means = 1.8–3.5). Around one-tenth (9.5%) of the sample belonged to the High-risk class with high degrees of suicidal ideation (item means = 5.1–6.8). The three latent classes showed high posterior classification probabilities (0.94–0.98) in the LPA model.

Comparison among the latent classes

Table 2 displays the profiles comparison among the three latent classes in 2018. There were no significant class differences in gender, age, and student status ($p = 0.48$–0.77) and less educated participants were more likely to belong to the High-risk class ($p < 0.01$). There were significant class differences ($p < 0.01$) in the total SIDAS score and psychological distress with increasing severity from the Low-risk class to the High-risk class. Participants in High-risk or Moderate-risk classes showed more frequent help-seeking behaviors than the Low-risk class except for offline informal help. Besides, the High-risk class showed a significantly

Fig. 1 Profiles of the three latent classes in 3-class latent profile analysis model in 2018
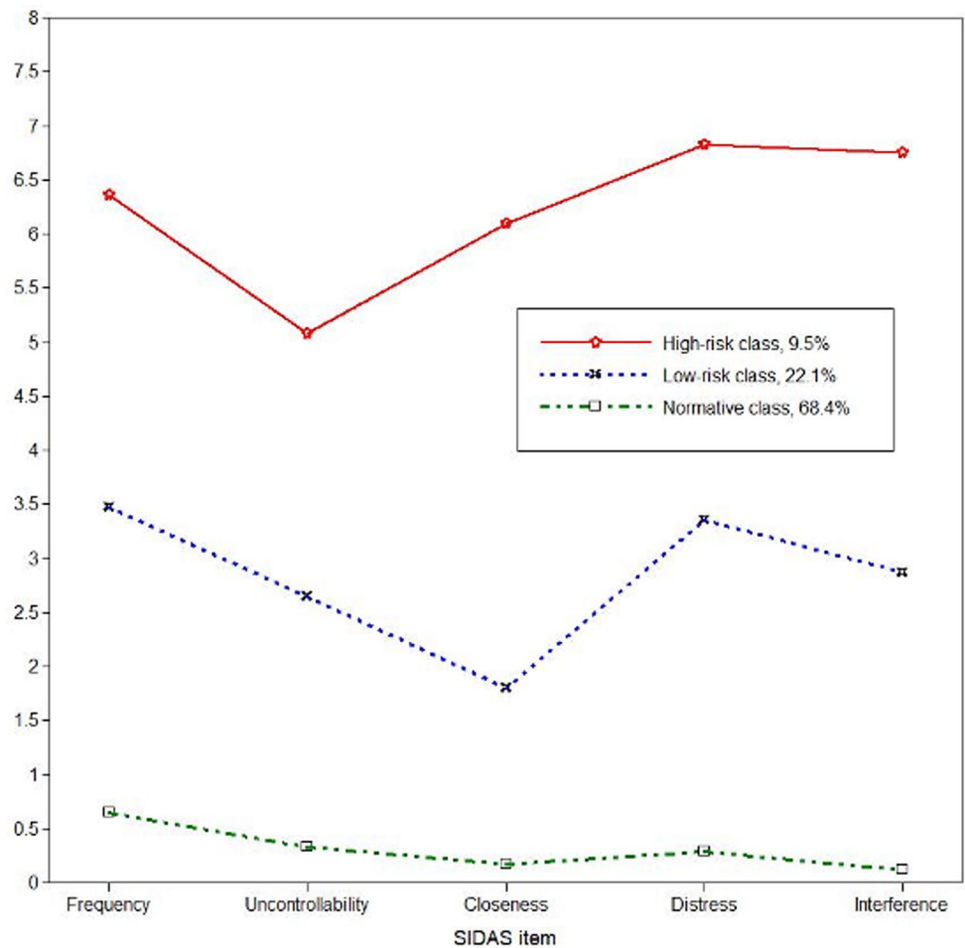

Table 2 Profiles comparison of the three latent classes of suicidal ideation under latent profile analysis in 2018

Variables	High-risk class (Class 1) (N=120) 9.5%	Moderate-risk class (Class 2) (N=281) 22.1%	Low-risk class (Class 3) (N=868) 68.4%	p	Post hoc class comparison
	N (%)	N (%)	N (%)		
Gender—female	31 (26)	95 (34)	253 (29)	0.48	
Post-secondary education	90 (75)	232 (83)	774 (89)	<0.01*	1<3
Student status	90 (75)	200 (71)	652 (75)	0.51	
Variables	Mean (SE)	Mean (SE)	Mean (SE)	p	
Age	24.0 (0.44)	23.8 (0.30)	24.0 (0.17)	0.77	
Total SIDAS score	31.1 (2.30)	14.1 (1.23)	1.55 (0.18)	<0.01*	1>2>3
Psychological distress	18.8 (0.58)	14.0 (0.36)	8.66 (0.19)	<0.01*	1>2>3
Help-seeking behaviors					
Offline informal	0.36 (0.03)	0.36 (0.02)	0.36 (0.01)	0.97	
Offline formal	0.20 (0.03)	0.08 (0.01)	0.05 (0.01)	<0.01*	1>2>3
Online informal	0.17 (0.04)	0.11 (0.02)	0.04 (0.01)	<0.01*	(1, 2)>3
Online formal	0.12 (0.02)	0.03 (0.01)	0.01 (0.01)	<0.01*	1>2>3

$N=1269$; *$p<0.01$; Chi-square test statistics for equality tests of means of continuous variables across classes derived via the BCH procedure with 2 degrees of freedom

greater likelihood ($p < 0.01$) to seek for formal help than the Moderate-risk class.

Although the 4-class LPA model showed the lowest BICs out of all measurement models, the High-risk class (item means = 6.8–8.9) only had a prevalence of 3.8%. In Supplemental Fig. S1, there were two overlapping classes with non-significant differences ($p > 0.01$) in four of the five SIDAS items. Supplemental Table S1 did not reveal significant differences between these two classes in most of the study variables. These results suggested a lack of clear substantive distinction among the four derived classes in the 4-class LPA model and provided support for the 3-class LPA model as the optimal model for the present sample.

Associations between participant attrition and the latent classes

Attrition analysis revealed no significant difference between the completers ($N = 822$) and dropouts ($N = 447$) in terms of demographic characteristics ($p = 0.09$–0.87) and help-seeking behaviors ($p = 0.19$–0.79). Those who dropped out of the study displayed significantly greater levels of suicidal ideation and psychological distress (Cohen $d = 0.43$–0.72, $p < 0.01$) at baseline. The attrition rate of the participants in the High-risk and Moderate-risk classes (61.5% and 50.7%) was significantly higher ($\chi^2 = 96.0$, df = 2, $p < 0.01$) than that in the Low-risk class (26.4%).

Transition in suicidal ideation from 2018 to 2019

The 1-factor longitudinal CFA model with measurement invariance showed acceptable fit to the 2018 and 2019 data ($\chi^2 = 115.1$, df = 37, $p < 0.01$, CFI = 0.971, and RMSEA = 0.041). The 3–3 class LTA models displayed substantially lower BICs than the 1-factor longitudinal CFA models (Table 1). The LTA model with measurement invariance estimated 15 fewer parameters with equal SIDAS item means across time for the three latent classes. This LTA model did not show a poorer fit with ΔBIC = 6.5 < 10 and supported longitudinal measurement invariance of the latent classes of suicidal ideation across time.

The prevalence of and transition probabilities among the three suicidal ideation classes from 2018 to 2019 are presented in Table 3. The prevalence of the High-risk class decreased from 10.2 to 7.2%, while the prevalence of the Moderate-risk class remained stable (17.3–17.6%). Compared to the Low-risk class, the High-risk and Moderate-risk classes displayed lower temporal stability with nearly two-thirds of them (64.8–65.8%) transiting into other classes in 2019. Age, gender, education level, and student status did not have any significant effects ($\chi^2 = 0.75$–6.61, df = 4, $p = 0.16$–0.94) on the transition pattern. Supplementary Table S2 reports the transition probabilities among the three

Table 3 Transition model of suicidal ideation classes from 2018 to 2019 and effects of changes in psychological stress on the transition

	Suicidal ideation class		
	High-risk	Moderate-risk	Low-risk
Prevalence			
Baseline (2018)	10.2%	17.3%	72.5%
Follow-up (2019)	7.2%	17.6%	75.2%
Transition probabilities			
2018→2019	High-risk	Moderate-risk	Low-risk
High-risk class	*0.352*	0.361	0.287
Moderate-risk class	0.128	*0.342*	0.530
Low-risk class	0.019	0.110	*0.871*
ΔCHQ = − 1 SD decrease → + 1 SD increase in 2018–2019			
2018→2019	High-risk	Moderate-risk	Low-risk
High-risk class	**0.403→0.543**	0.319→0.210	0.278→0.247
Moderate-risk class	**0.027→0.166**	*0.304→0.503*	0.669→0.331
Low-risk class	**0.002→0.026**	**0.085→0.162**	*0.913→0.812*

$N = 1269$; CHQ = Chinese Health Questionnaire; italicized transition probabilities refer to the same class membership at both times; bolded values denote increases in the transition probabilities

suicidal ideation classes from 2018 to 2019 across gender and age subgroups. No significant differences ($p > 0.05$) were found in the transition probabilities between males and females and between the younger subgroup (aged 18–24) and older subgroup (aged 25–35).

Associations between psychological distress and transition in suicidal ideation

Although psychological distress did not change significantly ($\Delta = 0.15$, SE = 0.21, $p = 0.48$) from 2018 to 2019, there existed significant inter-individual variations (Variance = 34.88, SE = 1.96, $p < 0.01$) in the temporal change. Controlling for demographic characteristics, baseline psychological distress in 2018 positively predicted odds of High-risk class (OR = 1.33, $p < 0.01$, 95% CI = 1.26–1.39) and Moderate-risk class (OR = 1.18, $p < 0.01$, 95% CI = 1.14–1.21) relative to the Low-risk class. Change in psychological distress did not significantly predict transition probabilities ($B = −0.01$ to 0.05, SE = 0.05, $p = 0.39$–0.90, OR = 0.99–1.05) for the High-risk class in 2018. Among the Moderate-risk class in 2018, increases in psychological distress significantly predicted higher odds of transiting to the High-risk class (OR = 1.12, $p < 0.05$, 95% CI = 1.03–1.22) and lower odds of transiting to the Low-risk class (OR = 0.91, $p < 0.05$, 95% CI = 0.84–0.99) in 2019. Among the Low-risk class in 2018, increases in psychological distress showed significant and positive effects on transiting to the High-risk class (OR = 1.25, $p < 0.05$,

95% CI = 1.09–1.44) or the Moderate-risk class (OR = 1.07, $p < 0.05$, 95% CI = 1.01–1.13) in 2019.

The bottom part of Table 3 portrays the changes in transition probabilities for participants in different latent classes with increasing versus decreasing psychological distress. Compared to participants with improved psychological distress ($\Delta = -5.76$ at Mean -1 SD), participants with worsened psychological distress ($\Delta = +6.06$ at Mean $+1$ SD) in the Moderate-risk class were less likely (66.9–33.1%) to move to the Low-risk class and more likely (2.7–16.6%) to move to the High-risk class. Among participants in the Low-risk class in 2018, participants with worsened psychological distress showed higher likelihoods to transit into the High-risk class (0.2–2.6%) or Moderate-risk class (8.5–16.2%) compared to those with improved psychological distress.

Transition pattern in suicidal ideation under different help-seeking behaviors

Around half (48.2%) of the sample did not report any help-seeking behaviors in 2018. The most common form of help was offline informal help (36.3%), followed by offline formal help (7.0%), online informal help (6.4%), and online formal help (2.1%). Table 4 depicts the transition probabilities among the three latent classes for participants in the Moderate-risk and High-risk classes with different help-seeking behaviors from 2018 to 2019. The majority (70.3%) of the participants who sought offline informal help belonged to the Low-risk class. Offline informal help was linked with an improvement for 46.0 (i.e., 41.1% + 4.9%) and 36.3% of the High-risk and Moderate-risk classes, respectively. Online informal help resulted in an improvement for 47.1% and 25.2% of the High-risk and Moderate-risk classes, respectively. Over three-fourths (78.0% and 81.9%) of the participants who sought formal help via offline and online sources belonged to the High-risk class. Offline formal help resulted in an improvement for 50.0% and 51.9% of the High-risk and Moderate-risk classes, respectively, while online formal

help resulted in an improvement for 33.3% and 71.5% of the High-risk and Moderate-risk classes, respectively.

Discussion

The present study systematically evaluated the latent structure of suicidal ideation in a large sample of young adults in Hong Kong. The present study is among the first to apply LTA to examine transition patterns in suicidal ideation in young adults. The three latent classes showed clear separation in psychological distress and help-seeking behaviors. The additional class in the 4-class LPA model did not exhibit adequate substantive distinction with existing classes and could likely imply a spurious class without much clinical relevance. The present findings on three latent classes of suicidal ideation and their prevalence rates are consistent with previous studies using latent class analysis [16, 22, 59]. The present sample displayed a tendency for transition over stability and around two-thirds of the at-risk young adults moved to other classes. In the present study, the decrease in the prevalence of the High-risk class from 2018 to 2019 resembles the finding by Thompson et al. [22] on the transition from High-risk class to Low-risk class one year later.

From a methodological perspective, the superior fits of the LPA/LTA models over the CFA models favored the person-centered approach over variable-centered approach to capture the sample heterogeneity in suicidal ideation. The present study empirically compared LPA models with different numbers of classes via model fit and substantive checking and the current results corroborate a three-class classification of suicidal ideation into low, moderate, and high suicidal risks. The latent variable approach explicitly evaluated the classification quality via the entropy measure, took into account potential misclassification, and should be considered more robust than the existing cutoff criteria [47]. Through the use of LTA, the present findings contribute to

Table 4 Proportion of usage in 2018 and estimated transition probabilities for adolescents with various help-seeking behaviors from 2018 to 2019

% of usage	Offline informal (36.3%)			Online informal (6.4%)		
Transition probabilities	High-risk	Moderate-risk	Low-risk	High-risk	Moderate-risk	Low-risk
High-risk class	0.540	**0.411**	**0.049**	0.529	**0.369**	**0.102**
Moderate-risk class	0.122	0.515	**0.363**	0.265	0.483	**0.252**
% of usage	Offline formal (7.0%)			Online formal (2.1%)		
Transition probabilities	High-risk	Moderate-risk	Low-risk	High-risk	Moderate-risk	Low-risk
High-risk class	0.500	**0.303**	**0.197**	0.667	**0.151**	**0.182**
Moderate-risk class	0.293	0.188	**0.519**	0.191	0.094	**0.715**

Transition probabilities in bold refer to transiting to a latent class with lower suicidal risk

a deeper understanding of the risk and protective factors of the transition in suicidal ideation.

Compared to previous studies [26, 28, 29], the present analysis provided more fine-grained results on the associations between psychological distress and suicidal ideation. Among the Moderate-risk and Low-risk classes, young adults who experienced increased psychological distress were more likely to report heightened suicidal ideation. According to the ideation-to-action framework [11], such a transition to the High-risk class could contribute to subsequent progression toward suicidal behaviors [13] when combined with an individual's capability for suicide [10]. In contrast, improvements in psychological distress alone were not found to predict favorable transitions of the High-risk class toward classes of lower risks. This discrepancy appears to suggest a unique service need of High-risk participants which require targeted and tailored suicide intervention strategies.

Offline informal help was the most common type of help-seeking behaviors and did not differentiate between the three classes of young adults. Over two-thirds of the participants receiving offline informal help belonged to the Low-risk class, suggesting that participants with minimal suicidal thoughts likely shared their daily hassles and minor issues within their social network. Offline formal help showed a consistent pattern of improvement (50–51.9%) in the High-risk and Moderate-risk classes. In comparison, online formal help displayed a lower and higher likelihood of improvement in the High-risk class (33.3%) and Moderate-risk class (71.5%), respectively. This result implies that offline formal help might be more effective in the High-risk class, whereas online formal help might be more helpful in the Moderate-risk class.

Practical implications

Amidst the current COVID-19 pandemic, social distancing procedures have been enforced to reduce human contact and control the spread of the virus. These measures have brought unintended consequences of inducing social isolation, stress, and anxiety [60], decreased access for community support, and barriers to mental health treatment [61]. These side-effects could increase the suicidal risks and suicide attempts among the young adults [62] and have long-term impacts on the society in terms of shorter life expectancy [63]. As shown in the present study, compared to the Low-risk class, participants in the Moderate-risk class were six times as likely to transit to the High-risk class. These findings highlight a potential service gap to address the mental health distress for those in the Moderate-risk class. Early detection of the Moderate-risk class could enable timely intervention to prevent further progression into the High-risk class.

The present findings contribute to empirical knowledge toward formulating effective interventions for youth suicide prevention. Apart from standard means, such as restriction of access to means of suicide and responsible media reporting of suicide cases, other potential strategies include improved access to mental health care via a 24-h online emotional support system and promotion of suicide prevention programs that are community based [64] or distance based [65]. Siu [66] has advocated earlier prevention strategies, such as online monitoring programs and life skills training programs, for the adolescents to help with their transition into young adulthood. A connected care model that combines online support with offline interventions could be promising in providing timely and appropriate service to the distressed individuals [36].

The internet plays a crucial role in searching for suicide-related information and shaping subsequent suicidal behaviors for at-risk individuals [67]. Digital treatment could be considered an accessible and viable alternative to face-to-face treatment for individuals who have existing distress symptoms but do not yet require specialist care. The Moderate-risk class showed a disproportionately low rate (3%) of seeking online formal help, which likely implies service underutilization arising from the unfamiliarity of these services. To raise public awareness of online formal help, suicide prevention professionals could adopt promotion means via social media to engage the distressed young adults who are difficult to engage offline [68]. De-stigmatization campaigns (e.g., it is OK not to be OK) could be delivered to remove the barriers to seek help. Further studies can evaluate whether these measures could enhance the usage of the online formal help among young adults in need.

Limitations

The present study had a number of limitations. First, the present sample was not recruited under random sampling and the study dropouts reported significantly greater suicidal ideation and psychological distress at baseline. The baseline difference could denote potential selection bias. The disproportionate attrition rate among the three latent classes could explain the fall in the prevalence of the High-risk class and underestimate the prevalence of the Moderate-risk class in 2019. Cautions should be warranted in interpreting the overall estimates of the between-group movements before replication. Second, the current study did not control for various relevant factors, such as unemployment [5], substance abuse [25], political uncertainty [69, 70], social transmission via the internet [71, 72], and the use of social media [73]. Other factors, such as suicide stigma [74], could result in perceived barriers to seek help [34] and stressful life events [23] could lead to isolation and loneliness [24]. Further studies should

investigate the roles of these socio-political factors [75] in the development of suicidal ideation in the young adults.

Third, the current study design consisted of only two assessments over a 1-year interval. A previous study [76] has found considerable fluctuations in suicidal ideation over shorter time frames (days). Intensive follow-up assessments are needed to elucidate the growth trajectories of suicidal ideation and timing of essential transitions, which casts doubts over the clinical relevance of the study findings. Study designs utilizing ecological momentary assessments are recommended to better capture the dynamics of changes in suicidal ideation across shorter time frames (days and weeks) and longer time frames (months and years). Fourth, the present study only offered a comparison based on the descriptive profiles of the transition pattern across different help-seeking behaviors. The overlapping nature of the help-seeking behaviors combined with the extremely sparse nature of online help-seeking behaviors made it difficult for us to incorporate them as predictors of the transition in suicidal ideation to disentangle the individual effects. Future research is required to systematically examine the effects of help-seeking behaviors on the transition in suicidal ideation and transition from suicidal ideation to suicide attempt.

Conclusion

The present study is among the first to examine the transition and stability of the three suicidal ideation classes in a large sample of young adults in Hong Kong from 2018 to 2019. Temporal linkages were found between worsened psychological distress and unfavorable transitions in suicidal ideation over one year. Differential transition patterns were found across different help-seeking behaviors and online formal help appeared to be effective for participants in the Moderate-risk class. These results put forward future directions on targeted interventions for distressed young adults and promotion of online help-seeking behaviors via social media.

Declarations

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