Modeling Developmental Trajectories of Adolescent Depressive Symptom across Junior High and High School

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Introduction

In a typical school day, adolescents use up approximately half their waking hours in the school environment. For adolescent students in Taiwan, the time they spend in school is lasted even longer. In some occasions, for example, those who are in the last year of schooling (e.g., junior high school third graders and/or high school third graders) may spend more than 12 hours in school. What does this mean? It means that, during this time, these adolescent students are exposed to teachers, peers, classes, programs, and policies, all of which are potentially influential socialization agents. Given that adolescence is a crucial period of identity development (Erikson, 1968), these daily influences should implement their impression on adolescent's emotional well-being in a tremendous yet intangible way. However, the fact is, researches have focused more on the effects of school organization on academic achievement rather than on students' emotional development.

Understanding different developmental pathways through adolescence has become an increasingly eminent topic among educationalists, developmentalists, child clinicians, and even sociologists (Cicchetti & Toth, 1996; Entwistle & Alexander, 1993). From a developmental perspective, examination of life paths require a center of attention on patterns of functioning across multiple domains (e.g., school, peers, and mental health), on continuity and change in patterns of adjustment over time, and on an integration of findings from both normative and atypical populations of adolescents (Cicchetti, 1984; Sroufe & Rutter, 1984). On the other hand, public concern over adolescents' mental health is also high in recent decades, in part, because of rising rates of suicide and the astonishing lethality of violent incidents involving adolescents (CDC, 1995; Koop and Lundberg, 1992; udn-yam, 2004a, 2004b; news-yam, 2004). The public seems to share the assumption that schools are influential to adolescents' emotional development (Rose and Gallup, 1999). Tragedies of violence and suicide are often anecdotally linked to the characteristics of

schools that cultivate alienation, exclusion, and anarchy. Accordingly, schools should be evaluated not only for their students' intellectual accomplishments, but also for their ability to promote sound social and psychological temperament.

At various times throughout literatures, theorists have been interested in the connections between children's academic motivation, learning, and mental health. Researchers interested primarily in education have focused on how emotions and motives are related to children's learning, achievement, and experience of schooling (Eccles, Wigfield, & Schiefele,1998; Weiner, 1990). Scholars interested primarily in personality development have explored how schooling, learning, and achievement are related to children's emotional development and mental health (McClelland, 1987). In recent years, researchers have again shown interest in understanding how adolescents' functioning in school, including academic motivation, achievement, and conduct, is associated with the quality of mental health (Roeser, Eccles, and Strobel, 1998).

Adolescents' Mental Health

Increases in suicide and lethal violence among adolescents have brought the psychological well-being of adolescents to the front position. Suicide rates have risen considerably in recent decades both globally and locally (CDC, 1995; Curran, 1987; Guyer and McDorman, 1998; Lin et al., 2002; Huang et al, 2003). This dramatic rise has not been seen for any other age group, suggesting that adolescents, in particular, are experiencing unprovoked distress. An extensive body of research has particularized biological, psychological, and sociological correlates of adolescents' destructiveness (whether internally or externally directed). Of the sociological risks, family, peer, and neighborhood influences have been found to be strong predictors. Adolescents who experienced family disruption, poverty, physical and emotional neglect, and abuse are all at an increased risk for poor mental health, as indicated by depression, eating disorders, substances, suicide, and violence (Katz and Marquette, 1996; King et al., 1997; Paschall, Ennett, and Flewelling, 1996; Wu, 2003). Isolation and poor peer relations are also important mental strains that have been linked to distress and destructive behavior (Brage, 1995; Garnefski and Okma, 1996; Wu and Lei, 2001, Wu and Li, 2001). Further, neighborhood characteristics have

been found to play an important and independent role in promoting adolescents' well-being. Community characteristics, such as residential stability and socioeconomic composition, have been associated to dropout rates, children's behavioral problems, and risk-taking attitudes and aggressive behavior among adolescents (Brooks-Gunn et al., 1993; Kowaleski-Jones, 2000).

Developmental theorists concern the question of how these depressive symptoms develop as a function of time. However, most of the past studies treated all the considered adolescents as a sole group with similar developmental trajectory. According recent studies (see Dekovie et al., 2004), depressive symptom is continuous change rather than stability. Several researchers (see Ge et al., 1994; Ge et al., 2003) even indicate that age, puberty and gender differences have demonstrated different of depressive symptom over time, especially age differences is the most importance (Brooks-gunn et al., 1989). Thus, each adolescent who grows through this critical period should demonstrate his/her own psychological development trajectory and this living experience couldn't be simplified into a general model, which can be used to illustrate a common pathway for everybody. However, for purpose of analysis, inducing them into several theoretically meaningful classes is possible and useful. This paper assumes that depressive symptom of adolescent will demonstrate different pathway from early to later adolescence. The first research question we ask is, empirically, how many classes of adolescents' depressive symptom development over time can be identified, which can serve as the starting point for this study?

School Characteristics and Adolescent Developmental Outcomes

Despite the increasing identification that schools play a decisive role in cognitive and social development, our knowledge of the impact of schools on development is still quite unsophisticated. Only recently, have scholars interested in school looked beyond the intellectual aspect to inspect how experiences in classrooms and schools influence adolescents' emotions, identity-related beliefs, and behavioral preferences. There are both practical and academic motives for studying the association of school characteristics and adolescent developmental outcomes. Perhaps most significant, the conjoint study of schooling and mental health is desired because many adolescents experience academic difficulties, emotional difficulties, or even

both (Dryfoos, 1994; Weist, 1997). common speculation is that adolescents receive a superior experience, intellectually and interpersonally, in private schools and in small schools. It is because that through a share value system (homogeneity) and/or small size, these schools are thought to produce a tight-knit community, which, in turn, offers high levels of social support and social control to its members. Social support and social control are supposed to be important for individuals in all communities, expecially for adolescents' academic and social development (Amato, 1989; Baumrind, 1971, 1991; Weiss and Schwartz, 1996).

The perceived superiority of private schools has received support from Coleman's (1990) finding of higher achievement in private schools. In addition, Coleman (1990) and Garbarino (1980) made persuasive theoretical arguments for small schools. These arguments have been supported by a few studies that have empirically linked small schools to lower rates of crime and misconduct (McPartland and McDill, 1976; Plath, 1965). However, evidence that small and/or private schools are conducive to emotional adjustment has been sparse. Coleman's (1990) findings for private schools did not address mental health, only academic achievement. In addition, most studies did not examine pressing public health issues, such as suicide and violent dispositions.

Some related theoretical arguments

In addressing studies of the association between school characteristics and adolescent developmental outcomes, several interesting theoretical arguments, which regarded this issue from different ankles are deserved to discuss.

First, in the landmark study of equality and achievement in education, Coleman et al. (1966) examined, among other things, the influence of family, peer, and school characteristics on adolescents' achievement. Coleman et al.'s unusual conclusion was that while the effects of family and peers are considerable, school characteristics only account for a small amount of the variation in academic achievement among adolescents. This implication was that investments in family and peer-group relations are far more important than are investments in school. However, the relevance of school characteristics remains unsettled. In his later work, Coleman (1990) presented evidence that achievement was higher in private (specifically Catholic) schools even

after the selective processes that give public and private schools different student bodies were controlled. A considerable body of work has promoted Coleman's findings of greater academic success for students who attend private Catholic schools (Hoffer, 1986; Lesko, 1988). The reasons have been attributed to higher standards and greater control and discipline (Coleman, 1990). Others have more generally argued for the merit of private schools, suggesting that private schools facilitate linkages among organizational participants (Bryk and Driscoll, 1988) and foster a greater sense of community (Coleman and Hoffer, 1987). It has also been asserted that private schools are superior because they are more responsive to parents and students than are public schools, which cater to political constituents (Chubb and Moe, 1990). Surprisingly, Most of these researches did not directly examine the relationship between attending a private, rather than a public, school and adolescents' mental health. One of the exceptions is Garbarino's review study. Garbarino argued that small schools promote character development because they are more successful at drawing students into active participation in extracurricular activities. Students in small schools, especially academically and socially marginalized students are more likely to participate in school activities whereas students in large school are superfluous spectators (Garbarino, 1980). The lack of participating in school activities may alien adolescent students from their school communities, which in turn further adolescents negative emotions.

Second, urban sociologists, such as Wirth (1939) and Park and Burgess (1925), provided theories of urbanization that have logical parallels with current perspectives on school organization. In that the school is a microcosm of the social world and a salient community for adolescents, these theories offer a useful organizing framework for studying the characteristics of schools. Perhaps as schools have become larger and more diversified, adolescents have suffered emotionally, as well as, academically, in the same way that Wirth (1939) and other posited that adults would be harmed by living and working in large, diverse communities. The diverse culture of the public school and the size of the large school would reduce the sense of shared purpose and community among their students. Thus, students would likely suffer from a lack of meaningful personal relationships and social integration. Durkheim (1951) linked the lack of social integration to suicide, and other researchers have related isolation to depression and suicide among adolescents (Brage, 1995; Negron et al., 1997). In addition, because large and/or public schools have less of a shared value system and

offer more anonymity, they reduce important elements of social control. Thus, deviance may be more common in large and/or public schools (Hirschi, 1969).

Third, although Wirth's (1939) theory of urbanization gained much popularity, empirical support for the theory has been mixed. Counterarguments have emerged. One of the alternative perspectives is the subcultural perspective (Fischer, 1975). Fischer noted that large populations are more accepting of diversity. Those who do not fit into the mainstream can form subcultures, rather than experience isolation. In a large, heterogeneous environment, adolescents, who are concerned with social acceptance, may benefit from the ability to form subcultures and may have a wider variety of friendship options that may reduce their risk of isolation. Thus, it is possible that by reducing isolation, these organizational structures will actually reduce external (violence) and internal (depression and suicide) manifestations of distress among adolescents.

On the other side, Reference Group Theory stresses that people's aspirations and self-evaluations are determined not only by their objective position but also by their standing relative to specific persons with whom they compare (Bassis, 1977). In his now classic paper, "The Campus as a Frog Pond," Davis (1966) first applied this reference group perspective to the study of college students. He argued that only those undergraduates who regard they are among the most able students are likely to build up the self-confidence necessary to hold up aspirations to high-prestige occupations. In other words, students form self-concepts about their academic abilities (as well as a broad range of other characteristics) is by a social comparison process. Particularly, it is through the way that comparing themselves with their schoolmates. Davis introduced the "frog pond' metaphor (e.g., *"it is better to be a big frog in a small pond than a small frog in a big pond"*) to suggest that student may develop relatively low aspirations if they are surrounded by very able schoolmates. A rather similar conception, presented by Marsh and Parker (1984) is the "frame of reference" hypothesis, which restrains that children develop self-concepts of academic ability by comparing "their own academic ability (more or less dispassionately perceived) with the abilities of other students within their school or their reference group…"(p.217). Such reasoning suggests a general principle concerning the conditions under which individuals evaluate themselves relative to one or another comparative reference group. That is, if student X and Y are alike in academic ability, but X's schoolmates (or classmates) are higher in average ability than Y's, then X is more likely to develop

a lower self-concept than Y since X's standard of comparison (i.e., frame of reference) is more challenging. It is the so-called "Big-Fish-Little-Pond" effect for self-concept. According to the frame of reference model, self-perceptions in educational settings are largely shaped by the process of social comparison. Students compare their own attributes and attainments with those other students within their own reference group (e.g., immediate class, school track, school environment, etc.; Zeidner and Schleyer, 1998) and use this relativistic impression as the basis for developing their self-perceptions and reaching conclusions about their academic achievement and social status. The model hypothesizes that it is better for self-concept to be a big fish in a little pond than to be a small fish in a big pond. Accordingly, predicted by this theoretical model, students will have higher self-concepts in mixed ability settings, where they are among the most able, than in selective settings, where all students are very competitive.

Lastly, early adolescence is unique in combining dramatic biological as well as essential cognitive and social changes. It is also a period that is important for development and course of certain types of behavioral problems, such as depression, eating disorders and norm-breaking behaviors. Because pubertal development is the most obvious and universal change during this period of life, it has often been in focus as a possible cause of adolescent adjustment problems. However, interactional models have proposed to understand such problems not as a direct consequence of biological changes, but as an interaction between individual factors, the social context, and psychological processes.

Interesting enough, these theoretical deliberations raise a number of unanswered questions, namely, for adolescent students who are wobbling through the pubertal period, what kinds of schools better not only for academic achievement but also for mental health? Are school characteristics associated with broad indicators of emotional well-being after controlling for puberty effect? More specifically, which domain(s) of school characteristics are better able to create a sense of social acceptance or uniquely to benefit adolescent students?

The study presented here sought to address these related issues, using data from TYP[1] to examine adolescents' developmental trajectories of depressive symptom and

[1] The Taiwan Youth Project is a panel study beginning from 2000, which conducted by the Family and Life Course Research Group of the Institute of Sociology, Academia Sinica. The Taiwan Youth Project currently is funded by the Academia Sinica as a Thematic Program of Academia Sinica, Taiwan (No.

its determinants with respect to several focal points of interest: individual, school, family and community.

Method

Data

The data used in this study comes from an eight-year longitudinal research with eight-wave surveys scheduled across 2000 to 2007 funded by Academic Sinica, Taiwan. It consists of two-cohort students: a sample of 2,696 7th grade students (first year of the junior high, "2KJ1" for short) and another sample of 2,890 9th grade students (last year of the junior high, 2KJ3"for short") in 2000. Its subjects of study are students of Taipei city, Taipei county and Yilan county which public and private secondary schools. It is a follow-up study-tracking subject for a long period. Data collected through questionnaire, including students, teachers and parents. Up to 2004, this project finished continuous data collection for five consecutive years. This article only analyzed data by 2KJ1 from Grade 7 to Grade 11 while students were still in school.

The Taiwan Youth Project employ a school-based, stratified sampling design. A sample of junior high schools in Taipei city, Taipei county and Yi-Lan county, stratified by the level of urbanization was selected. These three areas located in the northern part of Taiwan have different levels of urbanization and different economic structure. Specifically, Taipei city is the largest metropolitan city in Taiwan; Yi-Lan is a mostly agriculture-based county; and Taipei county is in-between these two regions. Thus, in the first stage of sampling, based on the level of urbanization, we divided Taipei city into three strata, Taipei county into three strata, and Yi-Lan county into two strata. In the second stage, based on the number of students registered in each stratum, we determine the numbers of schools in each stratum. Finally, 40 schools were selected from the pool: 16 schools from Taipei city, 15 schools from Taipei county, and 9 schools from Yi-Lan county. In each school, we randomly chose two classes in each grade and interviewed all students. Furthermore, since missing sample

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AS-93-TP-C01, acronym: "TYP").

in five wave surveys and excluding the sample that registered students, and because of listwise deletions of missing data on statistical procedures, our final sample includes 1804 of the students.

Measures

Depressive Symptom This study was used the Symptom Checklist-90-Revised (SCL-90-R, Derogatis, 1983) to capture adolescent's depression. SCL-90R included 90-behavior item but this study consider consistency of item for each time, therefore only to get two items. Two items measure how frequently lonely and sad, respectively, which rate on 5-point scale from one (never) to five (often time) of themselves during the past week. The 2 items were summed to create a depressive symptom scores

Family Relationships The family relationships consisted two linkages for father or mother with children. The item adolescents were reported to rate how satisfied they were with their relationship with their mother and their father (Tami, 2002). The response format for this instrument ranged from one (very satisfied) to five (very unsatisfied). Then, reconstruct this item is dichotomy variable (1 is unsatisfied and 0 is satisfied).

School Variables School variable comprise completed school, type of school level, academic performance and friendships within classroom. Below will detailed to the each variable.

Completed School The variable is not altering school across junior to high school period. If not different school from junior and high school is one, else is zero.

Type of School Level School level has two parts from time one to time five that are junior and high school period, respectively. Level for high school was measured using the basic competence test score and attended high school for all participants. Subsequently, count test average score for each high school. With regard to junior school level2, it constructed the basic competence score in a target class all students.

Academic performance Participants reported to ranking in their classroom at junior

[2] In fact, this variable represented to class ability because only two class for each sample school in project. If employ two class average scores reveal to their school which highly possibility to not possess representation.

school (Grade 8) and high School (Grade 10). We recount of this item is dichotomy variable (1=Top5 in class and 0=else) for the reason that not equally number of students in classroom.

Friendships This variable were measures at Grade 8 and Grade 10 is: "How many good friends in my classroom." When up to 15 friends assumed to so many friends in classroom, which it to represented is one and zero is else.

Individual Except for school and family variable, this paper also consists of gender, area and academic expectation, respectively.

Data Analysis

This study used a general growth mixture modeling (GGMM) and the Mplus Version 3 statistical software to identify and analysis growth trajectories for adolescent depressive symptom. In the past, deal with repeated data usually operated Latent Growth Curve Model ("LGM" for short), which employ meanstructure technology estimate intercept and slope parameter captures individual change of trajectory. Nevertheless, even though this method can resolve many related to change issues, which treats the data as used to mean and covariance for all data that can't consider difference for persons, this crisis especially show in mental health, delinquency, and alcohol issues, the LGM to have strongly homogeneity assumption in the growth trajectory which result in seriously statistic biased. In recently, researchers extended LGM methodology to solve dilemma, and they proposed GGMM. The mixture models built in the two statistical tradition including latent class and LGM model, separately (Muthen 2001). Notion of Mixture models is to separation individual into subpopulations base on specific parameters that different individuals to become a homogenous populations in sample. In addition, the modeling approach also provided is, 1) how many classes (subgroups) in change trajectories, 2) estimate the response probabilities for each class, 3) assign individuals into each class and tests the model fitting (Duncan et al., 2002). Below show formulas for a basic measurement models, k denote latent class (k=1,2…k), both η_0 and η_1 is intercept and slope,

$$y_{ity} = \eta_{0ik} + \eta_{1k} x_t + \varepsilon_{itk}$$

Whereas below is structural model,

$$\eta_{0ik} = \alpha_{ok} + \gamma_{0k} + \zeta_{0ik}$$

$$\eta_{1ik} = \alpha_{1k} + \gamma_{1k} + \zeta_{1ik}$$

where α coefficients are intercept parameters for the structural model, γ coefficients are regression weights, and the ζ denote residuals.

In regard to class probability, namely i[th] response falls in k categorical, where represented $\pi_{ik} = P(C_i = K)$. This paper used to BIC (Bayesian information criterion)[3] and Entropy[4] index test models fitting and comparison of models with different numbers of classes. In principle, the lower the BIC value and Entropy value close to one, denote greater clarity in classification.

After distinguish different patterns of depressive symptom through mixture model, we employ a profile plots and multinominal methods reveal to school, family and individual effect how to structure different classes for mental health.

Results

I. *Developmental typology of trajectories for adolescence depressive symptom*

In order to reveal the typology of change trajectory, model comparison strategy were used. As shown in Table 1, intercept only, intercept + linear and intercept + linear + quadratic functions is the nested, which can used to perform a chi-square difference testing to identify best fit of the growth model. Results show that the differences in chi-square both model 1 and model 2 is 596.58 and 362.61, respectively, that change chi-square has significant and it was selected model 2. Then, compare both model 2 and model 3 has significant difference ($\Delta \chi^2$.=157.72, P<0.05). In other words, a depressive symptom was nonlinear pattern over time.

(Table 1 about here)

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[3] $BIC = -2\log L + r\ln n$

[4] $E_k = 1 - \frac{\Sigma_i \Sigma_k (\hat{p}_{ik} \ln \hat{p}_{ik})}{n \ln K}$

Table 2 presents fit indices for 1 to 6 classes. Base on Muthen's (2001) proposes, we used BIC and Entropy index to identify the best fit model of mixture model. According to the two indices, 5 classes model is the best fit model (BIC=30578.33, Entropy=0.92). Though, consider parsimony of model, the number of cases for each classes, as well as another indices including SSABIC and AIC, we decided to select the four classes model (BIC=30811.81, SSABIC=30729.21, AIC=30668.87, Entropy=0.91) as this study's optimal model.

(Table 2 about here)

In order to discriminate clearly characteristic of all classes, we used depressive score mean for each class on each time point, that protract developmental track for four classes. According to changed trend for different classes (see figure 1), which the trajectory classes were named: stable (80.2%), worsen (5.9%), improved (8.9%) as well as up and down (5%). Our profile plot analyses show some quite exciting findings. On figure 1, similar patterns were found in both total and stable (class 1) models, however, the rest identified classes not alike for each other. This result is consistent with our heterogeneity hypotheses. Earlier research on adolescents' developmental issues only capture and discuss situation of stable model (class 1) and they ignore the other 20% of "abnormal" adolescent who need to be noted more tensely.

(Figure 1 about here)

II. *Descriptive statistics for Mixture models*

Mixture model analysis distinguishes four classes about stable, worsen, improved, and "up and down". Next, we used to a profile plot represented to pattern of four classes on gender, puberty, area, school variables, and family relationships etc. First, all plots consist of total model and target class in same figure, which total model has underline and black shape both number and form, else is target class. Figure 2 illustrated formations for total model and stable class is quite similar, therefore, previous research only reveal this pattern. Figure 3 combination of worsen and total model, it presented worsen class is more female than total model, worsen class mostly

in Taipei, numbers of friend are decreasing, and this class bad relationship with mother and father. In addition, total subtract worsen is -1.6% in top 10% for junior school but difference between total and worsen model is 2.1%, the results noted that junior transition to high school has some different in worsen group. Figure 4 indicated that a proportion of gender and area is similar worsen model. Regarding family relationship, although improved class is not good than total model, but the developmental change slow gradually from grade 8 to 10. In contrast, important factor is puberty for improved class; reveal precocity of adolescent has higher depressive symptom scores in initial time but it decrease at a later day. Finally, "up and down class" showed gender, area, academic performance, and not good family relationship is higher than total model (see figure 5). In academic expectation, about 74.2% expect to study university level and upward for self. Moreover, study type of school level is lower in grade 8 and 10 despite academic expectation has higher scores.

In sum, common characteristic for each class is: female, Taipei, and a bad family relationship. Difference factor between each class: worsen class focus on school context, improved class spotlight to puberty, as well as up and down model around the academic expectation and type of schools.

(Figure 2 about here)

(Figure 3 about here)

(Figure 4 about here)

(Figure 5 about here)

III. *School, Family and Individual Associated with Depressive Symptom Trajectories*

This paper statistically significant set for 10% due to stable class contain many sample (80.2%) than another class, unbalanced a proportion of sample size between each classes make easily insufficient variance. The consequences for the multinomial logit model with related variables are given in table 3. Worsen class was significantly predicted by gender, levels for junior school, and low family relationship for mother in grade 8 as well as father in grade 10. Next, gender, puberty, top5 in grade 8, and low family relationship significantly predicted improved class. Finally, up and down group was also significantly predicted by gender and low family relationship,

moreover academic expectation, completed school, levels of high school and friends significantly predicted this group.

(Table 3 about here)

In conclusion, these multinomial analyses revealed that same patterns for the foregoing plots. First, more female and low family relationship in worsen, improved and up down model. Second, precocity of adolescent in grade 7 can predicted a development of improved. Third, context and transition of school on adolescent is important effect for three classes. In worsen model, if despite variable significant or not, which clearly indicated that academic performance in grade 8 better that grade 10, but adverse results on improved class. Interestingly, group in "up and down" has higher academic expectation, supposing that people to enter optimal school are possibly decrease depressive scores in high school period.

Discussion

Based on empirically findings, we proposed discrimination of four trajectory classes, namely, stable, worsen, improved, as well as up and down. According to profile plots analyses, the stable class is similar to the total model, which consistent with heterogeneity hypothesis for individual. The findings that female, more negative family relationship, poor friendship, and living area accounted for common lineaments in worsen, improves, and "up and down" groups. In additional, worsen class were associated with academic performance from grade 8 to 10, students in this group show a higher school grade at 8^{th} grade and a lower school grade at 10^{th} grade. However, academic expectation not significantly predicted improved group. Individual variable (puberty) can determine to reason for improved mental health instead. Importantly, the results revealed significant relationship between "up and down" model and academic expectation. In other words, this group due to care too much about academic for self, hence performance were strongly linked to mental health. Thus, previous research including: school both size and type for Coleman, urbanization theory, as well as "fish and pond" effects; these perhaps capture a part of depressive features. In fact, various classes should be explained by different

mechanisms.

This paper only indicated that four trajectories associated with common and different factors. Yet, This paper can't clearly contribute to demonstrate the mechanism of the transition from junior high school to high school. We suggested that depressive growth curve should be broken into a number of line segments separated by semester. Then, applied the combination of multilevel and spline regression model to elaborate analysis at each piece of growth trajectory.

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Table 1
Comparisons of different growth functions:

Type of model	Model fit			Likelihood ratio test		
	χ^2	*df*	p-value	Model comparison	$\Delta\chi^2$	*df*
1. Intercept only	596.58	13	.00			
2. Intercept + linear	362.61	10	.00	Model 2 vs. 1	233.97**	3
3. Intercept + linear + quadratic	204.89	6	.00	Model 3 vs. 2	157.72**	4

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

Model 1, 2, 3 are nested model

Table 2
Fit indices for Latent Class Model

Number of latent classes	Fit indices of all models			
	BIC	SSABIC	AIC	Entropy
1 class	32051.43	32006.95	31974.46	
2 classes	31357.88	31300.70	31258.92	.95
3 classes	30952.84	30882.94	30831.88	.94
4 classes	30811.81	30729.21	30668.87	.91
5 classes	30578.33	30483.02	30413.39	.92
6 classes	30392.40	30284.38	30205.48	.91

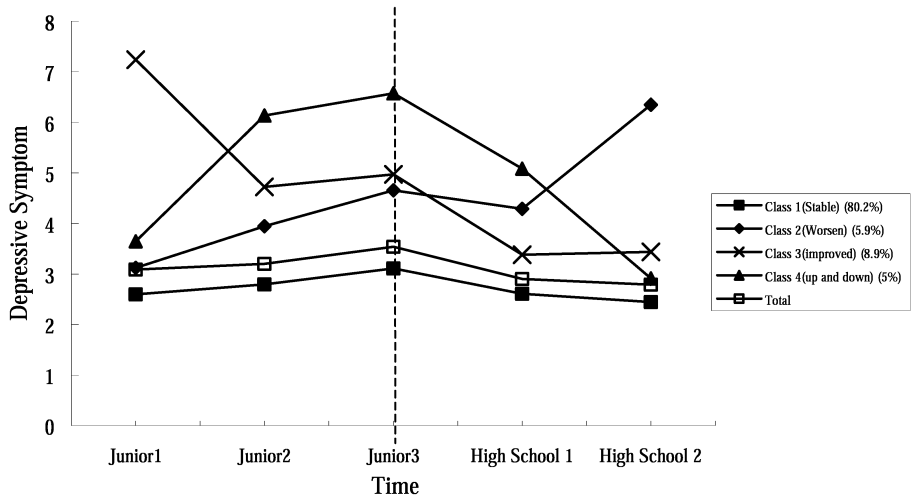

Figure 1. Latent class model mean trend

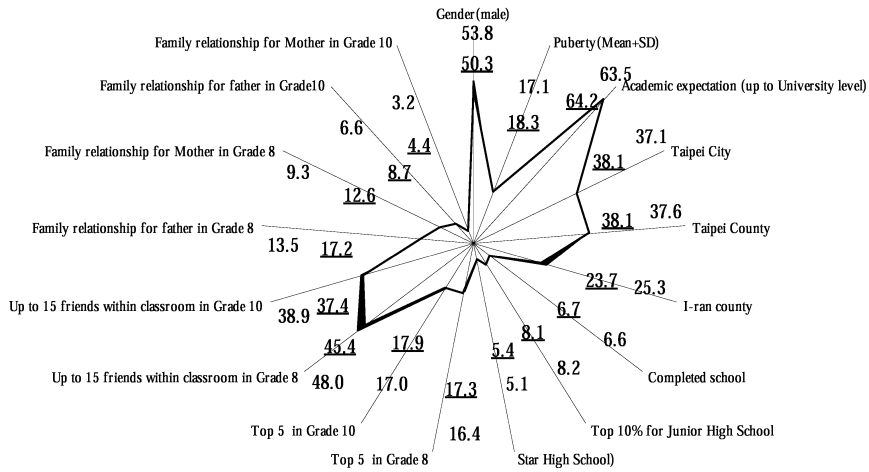

Figure 2. Profile to descriptive variable for stable class (N=1447)

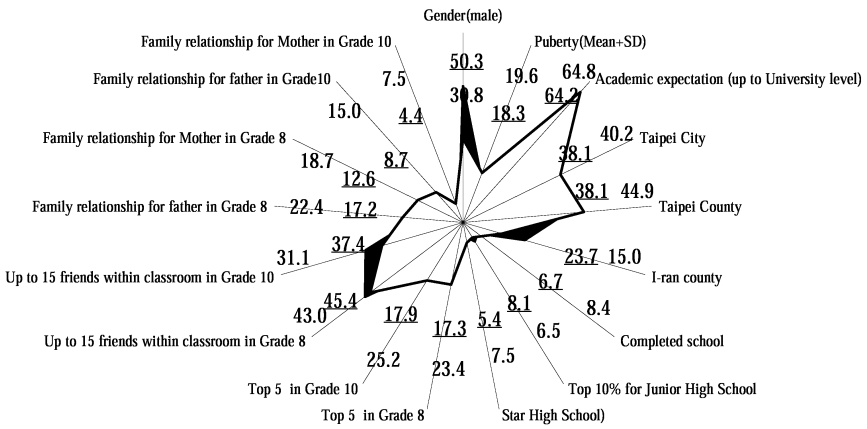

Figure 3. Profile to descriptive variable for worsen class (N=107)

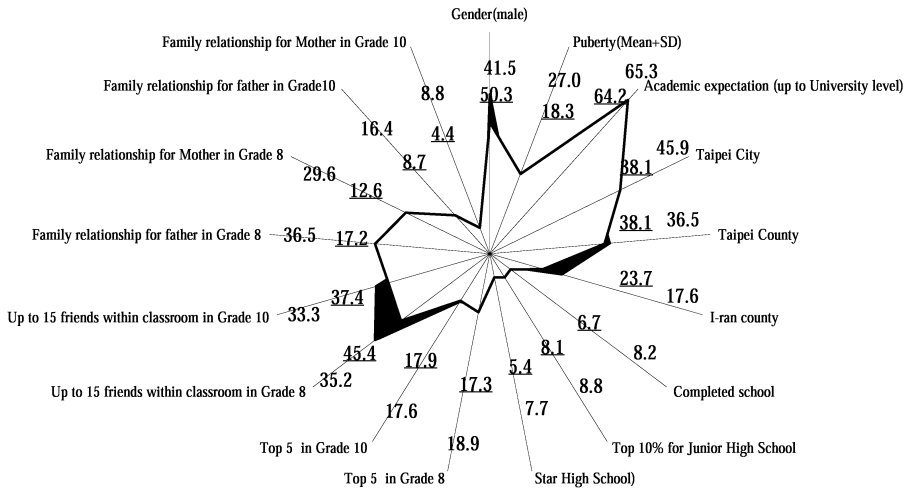

Figure 4. Profile to descriptive variable for improved class (N=159)

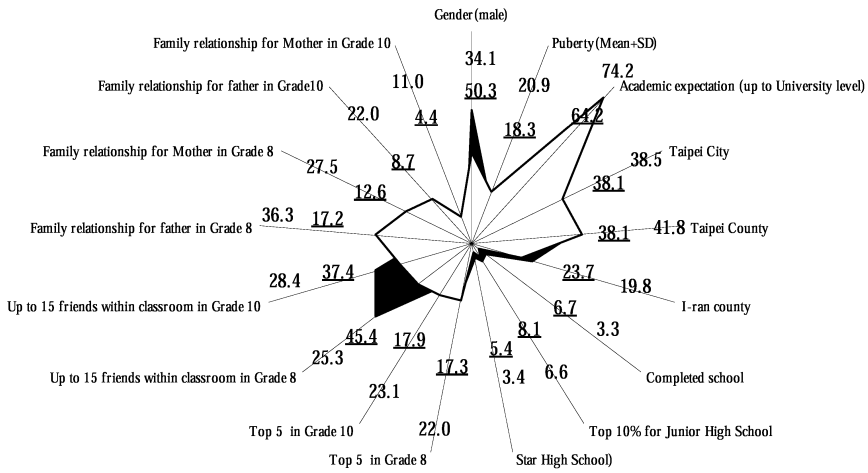

Figure 5. Profile to descriptive variable for up and down class (N=91)

Table 3
Parameter Estimates of a Multinomial Logit Model Predicting Different Trajectories of depressive symptom

Independent Variables	Worsen	Improved	Up and Down
Individual			
Gender (1=Male)	-0.86*	-0.44*	-0.57*
Puberty (Grade 7)	0.03*	0.47*	0.18*
Academic expectation	-0.07*	0.03*	0.30*
Area [Taipei City]			
Taipei County	0.25*	0.03*	0.09*
Yi-lan County	-0.16*	-0.29*	-0.48*
School			
Completed School (1=Yes)	-0.08*	0.08*	1.07+
Type of School level			
Levels for Junior School (A)	0.05*	0.01*	0.04*
Levels for High School (B)	0.04*	0.01*	0.05+
Academic performance			
Top 5 in Grade 8 (C)	0.43*	-0.58+	-0.50*
Top 5 in Grade 10 (D)	-0.23*	0.12*	-0.02*
Friendships			
Up to 15 friends within classroom in Grade 8	-0.31*	-0.35*	-0.34*
Up to 15 friends within classroom in Grade 10	-0.07*	0.15*	-0.81+
Family (1=no satisfaction)			
Family relationship for father in Grade 8	0.13*	0.74*	0.63+
Family relationship for mother in Grade 8	0.63+	0.81*	0.85*
Family relationship for father in Grade 10	0.65+	0.65*	1.03*
Family relationship for mother in Grade 10	0.32*	0.16*	0.23*
Interaction terms			
A × B	0.00*	0.00*	0.00*
C × D	-0.58*	0.95+	0.52*
Number of cases		1720	
Pseudo R^2		0.08	

Note: “Class as stable” is the comparison group
+P<.10, * P < .05