Adversity and internalizing problems among rural Chinese adolescents: The roles of parents and teachers

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Abstract
Throughout the developing world, adolescents living in rural poverty face multiple and inter-related adaptive challenges. Using longitudinal data from the Gansu Survey of Children and Families, we adopt an approach grounded in resilience theory to investigate the relationship between cumulative adversity and internalizing problems among 1,659 adolescents between the ages of 13 and 16 years in an interior Chinese province. We also investigate the compensatory roles of parental warmth and teacher support. Results of multivariate regression models suggest that internalizing problems increased in later adolescence in this sample. The rate of increase did not differ by gender, counter to most extant literature on sex differences in the developmental trajectory of internalizing problems. Along with parental warmth, teacher support emerged as an especially important compensatory factor, highlighting the significance of teachers as an often overlooked resource for poor rural adolescents.

Keywords
adolescents, adversity, China, internalizing problems, parental warmth, teacher support

Disciplines
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Adversity and internalizing problems among rural Chinese adolescents:  
The protective roles of parents and teachers

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Abstract

Throughout the developing world, adolescents living in rural poverty face multiple and inter-related adaptive challenges. Using longitudinal data from the Gansu Survey of Children and Families, we investigate the relationship between cumulative adversity and internalizing problems among adolescents in an interior Chinese province, and the protective roles of parental warmth and teacher support. Results of multivariate regression models suggest that internalizing problems increase in later adolescence. The rate of increase does not differ by gender in our sample, counter to most extant literature on sex differences in the developmental trajectory of internalizing problems. Along with parental warmth, teacher support emerges as an especially important protective factor, highlighting the significance of teachers as an often overlooked resource for poor rural adolescents.

Keywords: rural poverty, China, internalizing problems, cumulative adversity, parental warmth, teacher support.
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INTRODUCTION

Adolescents across the world are vulnerable to the deleterious effects of cumulative adversity on mental health outcomes. Adolescents living in poverty face adversity that differs in both type and scale from that encountered by youth in urban areas or highly developed regions of the world. Moreover, some research that suggests that adolescents in rural areas of the developing world may be at especially high risk because of the multiple and inter-related stressors associated with living in poverty in these settings (Evans, 2004). For example, poor rural youth grow up in environments frequently characterized by suboptimal physical conditions such as poor air and water quality, food insecurity and poor nutrition, and disrupted family structures. These youth are often raised in households where the adults tasked with caring for them are under great financial, psychological, and physical stress. They are also more likely to attend low quality, resource-constrained schools. In this way, adolescents living in poverty are not only at greater risk of experiencing a steady stream of adverse conditions, they frequently lack the social resources and support that could protect them from environmental stressors. To date, few studies have examined the risk and protective factors associated with adversity in poor, rural areas of the developing world. Understanding the distinct stressors experienced by poor, rural youth as well as sources of social support is essential for ensuring emotional adjustment and the attainment of desirable social and economic outcomes for this population.

In this paper, we take up this task by investigating the linkages between internalizing problems, cumulative adversity, and potential protective factors, such as parental warmth and teacher support, among rural adolescents in one interior province of China. To do so, we developed an index of cumulative adversity that includes risk factors specific to the experience of transitioning to adolescence in this setting. We use this index to address four research questions: 1) Is a high level of cumulative adversity associated with higher levels of internalizing
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problems among adolescents? 2) Does the association between internalizing problems and cumulative adversity differ by gender? 3) Are parental warmth and teacher support associated with lower levels of internalizing problems? 4) Does the association between internalizing problems and teacher support vary according to level of parental warmth?

FRAMEWORK: INTERNALIZING PROBLEMS, CUMULATIVE ADVERSITY, AND PROTECTIVE FACTORS

Internalizing problems and cumulative adversity

Despite evidence from many countries of the accumulating disadvantage for adolescents that results from mutually reinforcing adversity and adjustment problems over time (e.g. Kim et. al., 2003; McLanahan & Perchesk, 2008), the psychological impact of the cumulative stressors associated with living in rural poverty in China has not been a focus of researchers or policymakers. Some have suggested that because individual socio-emotional well-being is not traditionally stressed in collectivistic cultures, professionals and the public in China have tended to view psychological disorders such as depression and anxiety as problems of medical or political-ideological origin (Chen et. al., 2000). However, there is some evidence that children and adolescents in China experience levels of psychological strain that are equal to or higher than those among North American adolescents, and that levels of stress among Chinese youth continue to increase every year (Chen et al., 1995; Chen et. al., 2000). For example, survey data collected by the World Health Organization in four urban Chinese cities in 2003 reveals comparatively high levels of suicidal ideation and loneliness among adolescents aged 13-15 (WHO, 2003). Consistent with these findings, a comparative study of the Youth Self-Report (YSR) in seven different countries indicates that adolescents aged 12-18 in greater China scored much higher in the anxious/depressed domain of internalizing problems compared to U.S. adolescents, and above the mean compared to six other countries (Verhulst et al, 2003).
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Internalizing problems refer to a group of behaviors directed towards the individual, representing over-controlled and inner-directed patterns such as anxiety, social withdrawal, and depression (Ashford, 2008; Siu, 2007). Internalizing problems such as depression and anxiety can contribute significantly to long-term adjustment difficulties and problems of social performance that continue through adolescence and beyond (Chen et al., 2000). In a review of the risk factors associated with internalizing problems in children and adolescents, Garber (2006) highlights the risk associated with being female, having anxiety, having depressed parents, having subclinical levels of depressive symptoms, and being exposed to stress or trauma. Importantly, research findings indicate that no one factor is necessary or sufficient for increasing the likelihood of depression, but rather it is the accumulation of multiple stressors within a specific time period that is most consistently associated with increased depressive symptoms (Evans et al, 2007; Brooks-Gunn, 1991). Because these risk factors co-occur and covary, it is necessary to take an ecological approach that explores how poverty influences psychological development through exposure to multiple, accumulated stressors.

Cumulative adversity in rural China

Rural adolescents in Gansu province, one of China’s poorest provinces, are exposed to many sources of psychological stress. Research suggests that disadvantaged social groups are especially vulnerable to emotional reactivity to stressors (for a review, see Thoits, 1995). For instance, aside from the stressors commonly associated with poverty, such as food insecurity and family health problems, youth in China’s countryside face rising rates of parent migration from rural to urban areas (Rozelle et al., 1999; Iredale et al., 2001). Children are also leaving their households in increasing numbers due to increased funding for schools that serve multiple villages, which require students to move away from their families and into dormitories (Brown and Park, 2002).
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In addition to changes in household structure, the school domain may also increasingly impact adolescent mental health, particularly in rural areas. In one of the few studies on adversity and health from China, Unger and colleagues (2001) correlated stressful life events to depression and health behaviors among adolescents in Wuhan. They found that stressful events related to poor academic performance were highly predictive of depression, which highlights the salience of school-related adversity in China, and the importance of investigating how social processes moderate the impact of adversity on internalizing problems at school as well as in the home. Academic achievement has historically been emphasized in Chinese culture, but the pressure to succeed in school has intensified in recent years, particularly for children in small families and for rural youth who have not benefitted equally from China’s overall expansion of university access (Fong, 2004; Ding, 2006). Urban students occupy increasingly more spaces at 4-year colleges than students from the countryside, leading to ever greater marginalization of rural youth in the educational sector.

In addition, societal changes associated with social and economic development may be intensifying the scope and magnitude of challenges to psychological adjustment among China’s rural population. Recent tragic events in China, such as a series of massacres of schoolchildren in different provinces, have received wide coverage in Chinese and international media (see Xinhua, May 12, 2010; New York Times, May 12, 2010; BBC, May 12, 2010). Although the motives for these isolated incidents remain unexplained, they have led members of both the Chinese and international public to speculate that the social inequalities accompanying rapid development have intensified psychological strain among disenfranchised members of Chinese society (see Xinhua, April 28, 2010; China Daily, April 29, 2010).

The protective factor of social support: parental warmth and teacher support
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Social support has been established as an important protective factor for adolescents at risk of developing internalizing problems (Coyne and Downey, 1991; Thoits, 1995; Scaramella et al., 1999; Nettles et al., 2000; Kawachi and Berkman, 2001; Demaray and Malecki, 2002; Colarossi and Eccles, 2003; Malecki and Demaray, 2003; Little and Kobak, 2003; Taylor, S.E. et al., 2004). Here we conceptualize “protective factor” as a continuous variable that contributes to positive outcomes at every level of risk (see Leadbetter et al., 1999).

When multiple problems persist and accumulate, they strain the problem-solving capacity of the individual. In these situations, perceptions of available support from others lead to appraising potentially threatening situations as less stressful, and enhance coping performance (Cohen and Wills, 1985). Kawachi and Berkman (2001) explain that a more benign appraisal of a stressful situation can prevent a cascade of ensuing negative physical and emotional responses to stress. Physical responses can include disruptions of the immune system, changes in health-related behaviors, and failures of self-care (Cohen & Wills, 1985; Cohen et. al., 2000). Mental and emotional responses can include dysfunctional self-schemata or self-deprecating attributional styles, which contribute to the onset of depression, anxiety and other internalizing problems (Y.L. Liu, 2002).

Normative beliefs about the role of teacher involvement in students’ lives, and cultural perceptions of what it means to be a caring parent, suggest that both teacher support and parental warmth are likely important protective factors for high-risk poor youth in rural China. In rural areas, for example, families are often split up due to parents migrating for work in the city and children increasingly being forced to enroll in boarding schools far from their home villages (Adams, 2008; Liu et al, 2009). There is thus far very little research on how forms of social support function independently and together to facilitate adaptive development in the context of Chinese culture, and more broadly in the context of rural poverty. Moreover, most research on
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Adult social support for adolescents across all settings is limited by its nearly exclusive focus on the role of parents. In this paper, we extend the concept of social support beyond the family by exploring the role of teacher support. Teachers are a particularly under-researched resource for high-risk adolescents, who are less likely to seek professional help even when dealing with serious problems of adjustment (Luthar et. al., 2006). Moreover, as the following sections of this paper will explore, teacher support is likely especially important in rural China due to vastly different normative beliefs about parent and teacher roles in the support of children’s welfare (Hu, 2002, Liu, 2003, Fong, 2004).

**Parental Warmth**

Luthar et. al.’s (2006) review of conceptual issues in studies of resilience highlights the salience and proximity of supportive family relationships for children’s resilience (Luthar et. al., 2006). Bowlby (1952) and Ainsworth (1970) were instrumental in first advancing the idea that a warm, intimate and continuous relationship with a maternal figure in the earliest years of life causes the emotions of anxiety and guilt to develop in a moderate and organized way, leading to a legacy of research dedicated to investigating internalizing disorders within a developmental framework (Zahn-Waxler et. al., 2000). Since then, empirical evidence, primarily from developed countries, suggests that the presence of warm, nurturing or supportive relationships with at least one parent may act to protect against or mitigate the effects of adversity on internalizing problems (Burbach & Borduin, 1986; Coyne & Downey, 1990; Ge et. al., 1996; Scaramella et al., 1999; Fergusson, 2003). Evans et. al. (2007) found that physiological markers of chronic stress were only present as a result of cumulative risk factors among children who perceived low responsiveness from their mothers, suggesting that maternal responsiveness is protective against cumulative adversity.
Findings on parental warmth as a protective factor in the Chinese context are inconclusive. Support for the adaptive benefits of parental warmth is found in a study from Hong Kong, where Cheng (1997) used a prospective design to examine the role of perceived social support as a buffer between stressful life events and depression among adolescents in Hong Kong. Adolescents who encountered high levels of stressful life events but lacked perceived parental and peer support were found to be at greater risk for high levels of depression, while perceived support was not related to changes in depression for those under lower stress levels (see also Cohen, 2004). However, an investigation of psychological problems among children (aged 10 in 2000) with few siblings in rural China indicates that parental warmth may be associated with more internalizing problems (Liu, 2003). Liu attributed this finding to the phenomenon of “over-involvement” or “over-protection”, which for the only child or a child with fewer siblings, leads to greater disappointment and internalization of unmet needs and expectations. Likewise, Fong’s research findings (2004) suggest that smaller family sizes due to China’s family planning policies have changed household dynamics, so that adolescents face greater difficulties coping with adversity and adapting to changing circumstances because they perceive more pressure and responsibility from parents.

Chao (1994) emphasizes the “training” model of parenting in China, in which behaviors that might be construed as restrictive or authoritarian in the west provide, rather, a model for success and proper behavior among Chinese children, and are linked to highly involved concern and care for children. Terms such as “authoritarian” and “strict” may be considered indicators of risk in western settings, but have been associated with positive schooling outcomes in parenting research from China (Liu, 2003; Chao, 1994). Conversely, parental behaviors categorized as “warm” may be beneficial for development in one setting, while actually indicating risk in another. Such conflicting findings indicate a need for research to illuminate further the influence
of parents on the development of internalizing problems among poor youth in this setting, and also to investigate the function of social resources from other adults, such as teachers.

**Teacher support**

Existing literature on the relationship between teacher support and adolescent internalizing problems is scarce. Indeed, the relationship between students and teachers in general is a new area of inquiry which still lacks a clearly identifiable literature, despite the fact that the intentional component of child-teacher interactions could make them as important a focus of developmentally oriented research as mother-child or peer interactions (Pianta, 2006; Pianta et. al., 2003). Most studies of teacher support focus on academic and social outcomes as opposed to developmental and psychological outcomes. For example, Malecki and Demaray (2003) found that among adolescents in Illinois, teacher support was a significant main-effect predictor of academic competence and social skills. Gutman and colleagues (2002) found that among at-risk African-American middle school students, teacher support buffered the impact of adversity on school achievement. In an example from the China literature, An, Hannum and Sargent (2007) found that measures of teacher and student interaction predicted greater academic engagement and achievement. In a review of studies on student-teacher relationships, Pianta and colleagues conclude that from a student’s perspective, emotional closeness, involvement and support are salient factors that impact positive development in school-related domains (Pianta et. al., 2003).

To date, very few studies have investigated the effects of teacher support on psychological outcomes such as internalizing symptoms, but a small body of research suggests that teacher support may also serve as a protective factor for psychological adjustment. Ranjini-Reddy and colleagues’ (2003) study using longitudinal data on middle-school students, also from Illinois, found that students reporting increases in teacher support over time showed
corresponding decreases in depressive symptoms and increases in self-esteem, particularly among girls. Little and Kobak (2003) found that perceived emotional security with teachers moderated the reactivity of self-esteem related to negative peer events in both regular and special education classrooms. By and large, however, Pianta (2006) emphasizes that few developmental scientists to date have investigated the way that student-teacher dynamics intersect with developmental processes. A possible explanation is that while emotional support from teachers may be important for relational functioning at younger ages (Buyse et. al., 2007), middle- and high-school students are more likely to view their teachers as sources of instrumental and informational support rather than emotional or psychological support (Malecki & Demaray, 2003).

There is reason to expect, however, that teacher support may function differently in rural China. Hu (2002) writes that the structure of parent and teacher roles in China reflect fundamental values associated with education and the deep-rooted perceptions of the nature and process of teaching, which are different between China and the west. In China, teachers are expected to play the role of mentors or caregivers, making themselves available to the student for advice on a range of issues from the correct way of studying to personal problems. The social and moral aspects of teaching in China are clearly reflected in traditional honorific titles, such as ‘the people’s teachers’, ‘engineers of the human soul’, ‘sculptors for the future’, and ‘gardeners’, but these traditional metaphors are being challenged in the modernization period, in which teachers must navigate a complicated landscape of responsibilities (Paine, 1996). Because it is a Chinese teacher’s fundamental responsibility to ensure that all students progress satisfactorily, classroom teaching is only one of many diverse responsibilities making up the role of the teacher in China, (Tsang, 1996). Compared to other Asian countries, Chinese teachers spend more time on off-instruction activities such tutoring, class preparation, grading, and home visits (Tsang,
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1996). Because teachers can play a highly personal role in their students’ lives, and students spend much of their waking time on school-related tasks (Liu, 2003) it is important to consider support from a teacher as an important protective factor for the development of psychological disorders such as internalizing problems.

**Gender differences in internalizing problems and social support**

Previous studies from the U.S., Hong Kong and Taiwan emphasize differences between male and female adolescents in both level of internalizing disorder and response to social support (Ge, 1994, Cheng 1998). Findings suggest that girls are at least twice as likely as boys to become anxious and depressed, attributable to both a more frequent occurrence of environmental stressors among adolescent girls and to gender differences in reactivity to those stressors (see Zahn-Wexler et al., 2000 for a comprehensive review). Furthermore, most existing studies find that girls experience higher levels of internalizing problems as age increases than boys do, with internalizing problem scores following a curvilinear trajectory that begins to decrease sooner for males than for females during middle and late adolescence (see Botticello, 2009; Crijnen et al., 1997; Leadbetter et al., 1999; Zahn-Wexler et al., 2000; Bongers et al., 2003.) The differences in developmental trajectories for boys and girls have been explained by differences in pubertal development or different coping styles among boys and girls (e.g., Zahn-Waxler et al., 2000).

Just as importantly, social support may function differently by gender (Scaramella et al., 1999). In their study of rural adolescents in the U.S., Ge et. al. (1994) found that maternal warmth moderated the negative impact of life changes among adolescent girls more so than it did for boys. In Taiwan, Liu (2002) found that peer support had a stronger buffering effect against depression for girls than boys, and Cheng’s (1998) study from Hong Kong found that socioemotional support more strongly influenced girls’ outcomes than boys. The current study
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aims to expand the literature by investigating how internalizing problems and social support may function differently by gender in rural mainland China.

METHOD

Data

The Gansu Survey of Children and Families is a longitudinal project that traces various dimensions of rural children's welfare, such as education, health, and psycho-social development as children transition to adolescence and adulthood in Gansu Province. The GSCF surveyed a representative sample of 2,000 rural children, aged 9-12 years-old and predominantly of Han ethnicity, in the year 2000 using a multi-stage clustered design, along with linked surveys of mothers, heads of household, teachers, principals and village heads (Gansu Survey of Children and Families). A follow-up wave of survey data was collected from the original sample four years later in 2004 when the rural youth’s ages ranged between 13-16 years-old. The current study includes variables from both the 2000 and 2004 waves of the GSCF.

Measures

Internalizing Problems

In this study, the primary outcome, internalizing problems, is measured using a scale adapted from the Child Behavior Checklist – CBCL and Youth-Self Report (YSR) (Achenbach, 1991), edited for cultural relevance and time constraints (Liu, 2003). We use a self-report instrument because, while some studies of internalizing problems have been based on reports by parents or teachers, meta-analysis of such studies reveal that informant-reported measures of internalizing problems correlate only modestly with self-reports, and cannot fully substitute for youths’ own reports of their problems (Scaramella et. al., 1999, Verhulst et. al., 2003). The internalizing problem indicator for 2004 (Cronbach’s alpha=.82) is a summative score of responses for eighteen items, each rated in a 4-point scale, as “strongly disagree”, "disagree”,...
“agree”, or “strongly agree”. The internalizing problem construct includes symptoms of unhappiness, feelings of being unloved, mood swings, feelings of worthlessness, and feelings of being withdrawn (Liu, 2003). The scale has been shown a reliable measure of internalizing problems in research products from across the 3 waves of the GSCF (Liu, 2008).

Cumulative adversity

In our analyses, we utilize a cumulative adversity index that we designed to be both consistent with previously validated indices, such as the Junior High Life Experiences Survey (Swearingen and Cohen, 1985) and to include items specifically relevant to rural Chinese adolescents. The index is compiled from mother, teacher and household reports of changes between 2000 and 2004, and does not include items self-reported by the child. It covers multiple domains including family health, personal health, school-related difficulties, and changes in household structure. While some of the items included in the scale reflect universal sources of adversity, such as family death or illness, other items capture stressors faced by adolescents in rural China that are less commonly encountered in western contexts, such as moving into a school dormitory or living apart from parents who migrate to distant cities for work. The index also includes other rural poverty-specific items such as insufficient income and food insecurity. The index includes measures of poor school performance, because of the important role of school factors in predicting mental health status among adolescents, which is particularly critical in this study given the high prevalence of school anxiety in China (Chen et. al., 2000). We created a cumulative, rather than a weighted, index because previous research findings suggest that the number of life events encountered within a specified time period, as opposed to the novelty or types of events, are most consistently associated with increased depressive symptoms (Evans et al., 2007, Brooks-Gunn, 1991). Moreover, research reveals that adolescents are at greatest risk when they simultaneously experience multiple adaptive challenges. Additionally,
we included both independent events (for instance family death or parent migration) and those events which might be conceived of as dependent on the child’s decisions or behavior (for instance leaving school) because such factors typically operate in tandem and contribute to the cumulative impact of adversity (Garmezy, 1991; Kim et al., 2003). Table A1 provides a full list of the items used in the index.

After we calculated an unweighted score on the cumulative adversity index, we used the scores to create a categorical variable indicating whether the adolescent had experienced “high adversity” or not. Individuals with highest scores (80th percentile and above) were coded as “1” and all other scores were coded as “0”. This approach is based on findings that the effects of adversity on internalizing problems likely adhere to deleterious levels of risk rather than a continuum (Wethington & Kessler, 1986; Obradović et al., forthcoming).

**Perceived social support: parental warmth and teacher support**

The social support scales are constructed using adolescents’ answers to a series of questions about their relationships with their parents and teachers. Consistent with previous research, we use self-reported measures of social support to capture adolescents' perceptions of available relationship resources in times of stress (Leadbetter et al., 1999). For instance, in a study of Chinese adolescents, Cheng (1998) found that perceived support was associated with a reduction of subsequent depression. The mere expectation that social others will provide support when needed is likely more useful than enacted support, because the recipient reaps the benefits of perceived support without incurring the cost of explicit support receipt (Bolger, 2000).

The variable for parental warmth is a summative scale based on 18 child-reported items answered using a 3-point Likert scale (Cronbach’s alpha=.87, see Table A2). The scale reflects the degree to which respondents perceive their parents to exercise positive reinforcement,
encouragement, involvement, reasoning, and attentiveness, which represent characteristics of supportive parents considered beneficial across cultures (Dmitrieva et al., 2004).

The teacher support scale is a summative scale constructed of eight items answered using a four-point Likert scale. The scale (Cronbach’s alpha=.72, see Table A2) was constructed from items in a section of the child survey intended to assess various aspects of the student’s subjective school experience; it includes items reflecting the degree to which the respondents perceive teachers to be attentive, encouraging, caring and interested in them. Previous research using similar items to assess teacher-student relationships in rural China have been reliable (An, Hannum and Sargent, 2007; Chen & Adams, 2011).

**Individual control variables**

We include several important control variables to account for demographic and family background characteristics. Based on overwhelming evidence that the effects of both adversity and support can differ depending on developmental stage (Clark-Lempers et. al., 1991; Galambos et. al, 2003; Zahn-Waxler et. al. 2000; Obradović et. al., forthcoming), we include a series of categorical variables indicating whether the adolescent is 13, 14, 15, or 16 years old. We also consider prior internalizing problems by including responses to the same internalizing problem scale in the year 2000, in order to more precisely investigate the effects of proximal risk and protective factors. In addition, we include two variables to capture household’s socioeconomic status; family wealth and mother’s education. The family wealth variable used in this study is a composite variable taking into account income as the value of wages, income from personal businesses, and total value of agricultural production, all net of expenses. We transform it by taking its natural log. Mother’s education is measured by the years of schooling the mother has completed, and is included because of the substantial research from both China and
internationally indicating the significant effect of parent education on children’s developmental outcomes (e.g. Connelly and Zheng, 2003).

**Village control variables**

Much research has sought to illuminate how economic, institutional, and social forces in different communities shape both the emotional and cognitive development of children who live in them. Several researchers in the United States and China have connected community characteristics to school readiness and academic achievement (Chase-Lansdale, et al, 1997; Klebanov, et al; Adams, 2006; Chen, 2011). Other studies have established empirical links between community influences and child behavioral and emotional problems (Brody et al, 2001; Brooks-Gunn, 1993). Still others have emphasized the effect of community conditions on families and parenting behavior (Booth & Crouter, 2001; Furstenberg, 1993; Simons, Johnson, Conger, & Lorenz, 1997). In order to account for differences in adolescent internalizing problems that are related to dimensions of the community, we include measures of economic and human capital resources in the village: the log of village per capita income and the middle school graduation rate.

**Analytic approach**

The analytic sample used for our analyses comprises 1659 adolescents. Because we are interested in the role of teacher support as a protective factor, we further limit our analyses to adolescents who are currently in school, excluding 190 youth who were not currently enrolled. Given the nested structure of the data, we estimate random effects models to take into consideration the correlations among students from the same villages. An examination of the estimated coefficients associated with each of the main effects then indicates whether the selected measure is associated with internalizing problems, net of other variables in the model. An example of a typical random effects model is:
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\[
\text{INTERNALPROB}2004_{ij} = \gamma_{00} + \gamma_{01}\text{VPCINCOME}_{ij} + \gamma_{02}\text{VGRADRATE}_{ij} + \gamma_{03}\text{FEMALE}_{ij} + \gamma_{20}\text{LWEATLTH}_{ij} \\
+ \gamma_{30}\text{MEDUC}_{ij} + \gamma_{40}\text{INTERNALPROB}2000_{ij} + \gamma_{50}\text{AGE}_{14ij} + \gamma_{60}\text{AGE}_{15ij} + \gamma_{70}\text{AGE}_{16ij} + \gamma_{80}\text{HIGHADV}_{ij} + u_j + \varepsilon_{ij}
\]

where \text{INTERNALPROB}2004 is the internalizing problem scale for the \(i^{th}\) child in the \(j^{th}\) village in 2004. \(\gamma_{00}\) represents the estimated average internalizing problem value in the population providing all variables are centered on their grand mean, \(\gamma_{01}, \gamma_{02}, \gamma_{03} \ldots\) are regression parameters representing the main effects of community level predictors on internalizing problems, and \(\gamma_{10}, \gamma_{20}, \gamma_{30} \ldots\) are the regression parameters associated with individual level control variables, such as high adversity. Residual \(\varepsilon\) is the unique error term associated with student \(i\) in village \(j\) and \(u\) is a random effect, representing the common unobserved characteristics that distinguish village \(j\).

In models A and B, we present baseline models that take into account individual and village-level controls variables. Then, in Model C, we begin by investigating whether adolescents who have higher levels of cumulative adversity have more internalizing problems, on average, controlling for child background and community characteristics. This is followed by Model D that tests whether the association between internalizing problems and high adversity differs by gender, controlling for the other individual and village characteristics included in the model.

In Model E, we investigate the effect of parental warmth and teacher support. We tested models that added parent warmth and teacher support separately, and found that the results did not differ from those obtained when adding the support variables simultaneously. For that reason, we display both support variables in Model E. To check against the potential fallacy of labeling a protective factor as such when it actually represents a benefit only for children at lower levels of adversity, we ran a test of simple correlations between the hypothesized assets (perceived parental warmth and perceived teacher support) and the outcome variable (internalizing problems) for both the high and not-high adversity groups separately, according to the procedure
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described by Luthar and Goldstein (2004). The results show that the support variables are not
being reported in systematically different ways between groups with differing levels of adversity.

Finally, in our best-fitting model, Model F, we include an interaction term to investigate
whether the relationship between teacher support and child internalizing problems varies
according to the level of parental warmth. For example, the effect of teacher support may be
more pronounced for adolescents with less parental warmth. Alternatively, the coefficient on the
interaction term may not be significant, indicating that the effect of parental warmth and teacher
support may be additive.

RESULTS

Table 1 presents descriptive statistics for the sample for boy and girls. The sample has
slightly more males (54%) than females (46%) overall, but males and females are not
disproportionately represented at each age. A series of t-tests and chi-square tests were
conducted to see if boys and girls differ systematically in characteristics represented by control
variables. Measures of family wealth, mother’s education, and village middle school graduation
rates are slightly higher among the males in the sample (significant at $p<.05$). Prior internalizing
problems and measures of village wealth do not differ by gender. Furthermore, boys and girls in
this sample do not experience systematic differences in the risk and protective factors analyzed
in the current study, confirmed by the results of t-tests. As Table 1 shows, boys and girls have a
similar mean score on the dependent variable of internalizing problems, a similar score on the
cumulative adversity index, and report similar mean levels of both parental warmth and teacher
support.

[TABLE 1 ABOUT HERE]

Random Effects GLS results
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Table 2 presents the results of the random effects regression models. The results of a Hausman test (p=0.850) indicate that we cannot reject the null hypothesis that the coefficients estimated by the random effects estimator are the same as the ones estimated by the consistent fixed effects estimator. Thus, we estimate random effects rather than fixed effects in our analyses.

[TABLE 2 ABOUT HERE]

In Model A, we estimate a baseline model including only individual and family background variables. Age is the only individual background variable with a significant and positive association with higher internalizing problems. Consistent with previous research, older adolescents in this sample experience more internalizing problems on average than younger adolescents. We examined bivariate associations between adversity and age to be sure the results were not simply attributable to increased exposure to adversity among the older adolescents. Average scores on the cumulative adversity index did not differ systematically by age. Prior internalizing problems do not emerge as significant predictors of internalizing problems, suggesting that patterns of internalizing problems are not static but rather shift throughout adolescence (Botticello, 2009). Because most of the children in the sample come from fairly similar levels of poverty and family background, it is not surprising that neither family wealth nor mother’s education are significantly associated with internalizing problems in this sample.

In Model B, we extend the baseline model to take into account village level characteristics, specifically adding village-level controls representing village per-capita income and the middle school graduation rate of villagers in the work force. Results indicate that higher per capita village income is associated with higher internalizing problems, on average consistent with relative deprivation models of neighborhood effects, which suggest that a variety of social processes prevent relatively poor children from realizing the benefits associated with living in
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advantaged communities (see Jencks and Mayer, 1990; Leventhal and Brooks-Gunn, 2000). Higher middle school completion rates are associated with lower average internalizing problems, which may relate to the importance of village social capital in China (see Adams, 2006).

In Model C, we investigate the relationship between high adversity and internalizing problems, controlling for individual and village characteristics. Our findings indicate that net of controls, adolescents with high adversity have higher levels of internalizing problems, on average. Holding all other variables constant, those with high adversity have internalizing problem scores that are around one standard deviation higher than those in the low adversity group, a significant difference. Model D suggests that this relationship between adversity and internalizing problems does not differ significantly by gender.

In Model E, we examine potential protective factors: parental warmth and teacher support. Both parental warmth and teacher support have a negative association with internalizing problems in the expected direction, indicating that adolescents with higher levels of parental warmth or teacher support have lower internalizing problems, on average. All variables that were significant in the main effects models retain significance in the combined model. Age remains positively and significantly associated with internalizing problems for both boys and girls in this sample, and the coefficients for adversity and both support variables retain the same level of significance in the predicted directions. The coefficient for adversity is slightly attenuated by the addition of the support variables, suggesting that parental warmth and teacher support have a slight moderating effect on the relationship between adversity and internalizing problems.

In Model F, we include an interaction term between parental warmth and teacher support to investigate whether the benefits of these two sources of support are additive or interactive. The coefficient for the interaction term is small, but significant and negative. This suggests that parental warmth and teacher support are interactive and complementary to each other; teacher
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support is more strongly associated with fewer internalizing problems for those adolescents who report high parental warmth.

The specific effects of parental warmth and teacher support can be better appreciated in Figure 1, in which we display predicted internalizing problems as a function of protective factors. Here, we display the predicted values for internalizing problems for a prototypical female student, age 14, with high levels of adversity. In this plot, we hold child background and other village level characteristics constant. The standardized teacher support index is displayed on the horizontal axis centered around the mean of zero. Adolescents with high levels of teacher support have values greater than zero. The three downward sloping lines represent low, medium and high levels of parental warmth.

Figure 1 shows that there is a negative relationship between teacher support and internalizing problems at all levels of parental warmth. All else being equal, including parental warmth, adolescents with higher levels of teacher support have lower internalizing problems. In addition, the prototypical plot displays the significant interaction between parental warmth and teacher support. In other words, although the association between internalizing problems and teacher support is consistently negative at all levels of parental warmth, the magnitude of the effect differs according to parental warmth. The magnitude of the slope of the dotted line, representing high parental warmth, is greater than the other lines representing medium and low parental warmth. For example, the difference in the predicted value of internalizing problems between the prototypical female with medium teacher support (50\textsuperscript{th} percentile) and high teacher support (90\textsuperscript{th} percentile) is .45 for adolescents with low parental warmth, 1.0 for adolescents with medium parental warmth, and 1.6 for adolescents with high parental warmth.

Just as importantly, Figure 1 also illustrates that the association between internalizing problems and parental warmth varies according teacher support. For example, at low levels of
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teacher support (10\textsuperscript{th} percentile), adolescents with high parental warmth have the highest levels of internalizing problems; although the magnitude of the effect is small. At low levels of teacher support, there is a difference of .10 in the predicted values of internalizing problems between girls with high and low parental warmth. However, at high levels of teacher support (90\textsuperscript{th} percentile), females with high parental warmth have the lowest internalizing problems, and the gap in predicted internalizing problems between girls with high and low parental warmth, at 2.1, is larger.

[FIGURE 1 ABOUT HERE]

Discussion

A major contribution of this study is the development of a cumulative adversity index that can be linked to mental health outcomes in this rural setting characterized by poverty. Previous studies have applied adversity indices from other settings and used them in China (Dmitrieva et al., 2004). However, adolescents in this sample face risk factors that differ from those encountered by their counterparts in highly developed regions. The items included in our adversity index, which are found to be associated with higher levels of internalizing problems in this sample, are relevant not only in Gansu Province but other settings across the world where adolescence face the multiple, cumulative challenges associated with rural poverty.

Our analyses are consistent with previous research from the United States and other nations that highlights the positive association between age and internalizing problems (Botticello, 2009; Clark-Lempers et. al., 1991; Galambos et. al, 2003; Zahn-Waxler et. al. 2000; Obradović et. al., forthcoming). A noteworthy example of this work is a cross-cultural study by Crijnen and colleagues (1997) which found that with great consistency across 12 different cultures, internalizing problem scores increased with age while total and externalizing problem scores declined. Our results using a sample of poor rural youth in Gansu province echo these
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findings, and suggest dynamic patterns of coping and resilience that shift during different stages of adolescence.

Interestingly, and counter to findings from other settings, our descriptive findings reveal that the trajectory of internalizing problems by age does not differ by gender, as reflected in Figure 2. While most existing studies from the west find that girls experience higher levels of internalizing problems as age increases than boys do, the internalizing problem scores among boys in this sample increase at a similar or even greater rate than those of girls. Furthermore, the mean internalizing problem scores at different levels of adversity in Figure 3 reveal that, prior to adding controls, boys have higher average levels of internalizing problems in the presence of high adversity.

However, despite these descriptive findings, the results of the GLS models do not reveal a significant effect of gender when controls are added. The differential effects of cumulative adversity on internalizing problems by gender in rural China clearly need to be further studied, taking into account interpersonal behavior differences, divergent expectations of behavioral autonomy between boys and girls, and the reciprocal effects of stress and vulnerability over time (Chung et al., 2009; Zhang & Fuligni, 2006; Leadbetter et al., 1999).

Importantly, our analyses illuminate the association between internalizing problems and two hypothesized sources of social support: parental warmth and teacher support. Parental warmth is found to be a beneficial protective factor in this sample for both boys and girls. These results differ from Liu’s (2003) findings with the first wave of GSCF data, which showed that higher levels of parental warmth were associated with higher levels of internalizing problems.
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among younger children in small families. Liu attributed this finding to “over-involvement” or “over-protection” from parents leading young children to internalize disappointments more acutely. Our contrasting findings may be explained by differences in developmental stage. Galambos et. al. (2003) write that early adolescence is a demanding transition time for parents, who must remain supportive and relax control while facilitating appropriate levels of autonomy in their children, which may actually strain some youth’s adaptability and coping mechanisms (see also Zahn-Waxler et. al., 2000). At the time of the current study, the children in our sample are older than they were during the first wave of GSCF data collection, and therefore able to navigate their relationships with greater autonomy. At these stages, parental warmth emerges as a beneficial protective factor, suggesting that the role of parental warmth and involvement across different cultures may be more convergent than it is divergent (Dmitrieva et al., 2004).

Beyond the independent benefit of parental warmth, it also appears to play an important role in influencing adolescents’ response to the benefits of teacher support. The significant interaction between parental warmth and teacher support shows that teacher support is more strongly associated with fewer internalizing problems among those with higher parental warmth, suggesting that adolescents with a strong support base in the home may be better able to perceive and respond to support in other settings (Epstein and Sanders, 2006). The findings imply that programs directed at helping both parents and teachers to support adolescent mental health may have positive benefits (Garmezy, 1991; Colarossi and Eccles, 2003). Because family relationships are in the process of evolving in response to broader social and economic change in China (Zhang and Fuligni, 2006), future research should continue to investigate the roles of family and non-family support in China and other countries transitioning to a market economy.

Years of research have established that a supportive relationship with at least one caring adult can be critical for children’s resilient adaptation, and that adults other than parents can be
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important social resources (Garmezy, 1991; Colarossi and Eccles, 2003; Luthar et. al., 2006).

However, teacher support has been largely overlooked as a resilience factor in literature from the
developed world, where most studies have concentrated on how teachers influence academic
outcomes (Gutman et. al., 2002). The findings of the current study suggest that teacher support
plays an important role in the psychological well-being of adolescents in rural China, as both an
independent protective factor and in tandem with parental warmth. According to our results,
teacher support is significantly associated with fewer internalizing problems controlling for age
and other background variables, and teacher support appears to be a protective factor against
internalizing problems for adolescents even at the highest levels of risk. These results suggest
that while historically “school-related” and ‘social-emotional” have been separated into two
separate domains of adolescent development (Roeser et. al., 2000) this dichotomy may not be
appropriate for conceptualizing the psychological development of youth in China, where students
spend many of their waking hours on school-related activities and teachers are highly involved in

The overlapping domains of school, home and community are not limited to China, but
rather can be observed among children who live in rural poverty world-wide. Schools in the
developing world are sites where much more than academic learning takes place: schools can be
a place where children go to escape the disabling consequences of poor home environments
(Garmezy, 1991). The preexisting infrastructure of the educational system, and the fact that low-
income countries typically have far more teachers than they do nurses, means that schools are an
often-used route for the delivery of simple health interventions and general health promotion
(Jukes et al, 2008; Jamison et al, 2006). Researchers, policy-makers and non-governmental
organizations have begun to re-conceptualize the school setting as an ecological entity, linked to
parallel ecologies of the homes and communities that it serves (McCall et al, 2005).
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Teachers, then, must be conceptualized as more than purveyors of academic knowledge. The findings of the current study suggest that teachers influence the socio-emotional well-being of their students, particularly during sensitive developmental transitions at different stages of adolescence. Furthermore, the interaction model suggests that teachers and parents working in concert may be able to provide the strongest support for adolescent mental health (Nettles et al., 2000 Garmezy, 1991). These findings have important implications not only for future research, but also policy reform and interventions that train schools and teachers to develop supportive environments in the classroom.

Conclusion

Mental health continues to emerge as an urgent global health concern, particularly in developing countries where social and economic transformations have increased rates of inequality, unemployment, poverty, and displacement. Research among marginalized groups must take into account the developmental trajectory and social influences of mental health. The current findings from China have implications for other areas of the developing world where children face the multiple and cumulative adaptive challenges of living in rural poverty. The current study suggests promising directions for further research and policy, and can be expanded and improved upon in a number of ways.

The present findings suggest that cumulative adversity, as measured by a global index, is associated with internalizing problems. This index for measuring cumulative adversity was created post-hoc from existing survey data, and future research can aim to include more exhaustive measures of adversity. Stressful life events related to parental marital conflict, for instance, are not included in the present index, and these have been shown to have a strong psychological impact on adolescents (see Kim et. al., 2003). Further research should also examine whether breaking the adversity index into different domains would reveal differential
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effects on mental health outcomes, or differential interactions with social support. For instance, support from teachers, parents and peers may operate divergently in relation to different domains of adversity such as personal health, family health, academic hardship or structural changes in the household (Kendler et. al., 1999, Keiley et. al., 2003).

Measures of social support could also be expanded. Importantly, peers should be considered an important source of social support in addition to, and in combination with, parents and teachers (Galambos et. al., 2003). Because of data constraints, peers were not included in the current study. In addition, variability across informants has been consistently demonstrated in research on psychopathology, so future studies should compare results between reports of adversity, internalizing problems and support from a variety of different sources (Verhulst and van der Ende, 1992; Leadbetter et al., 1999). The findings of the present study could also be strengthened, and more consistent patterns revealed, if continued longitudinally with repeated measures to investigate how adversity and protective effects vary across time and different developmental periods. At present, researchers have a limited understanding about how early exposure to adversity augments the effect of later exposure in addition to exerting an independent influence on mental health outcomes (Thoits, 1995; Obradović et. al., forthcoming). Finally, and importantly, further research should examine the possibility of reciprocal effects as they relate to both adversity and social support. Children actively shape their experience of adversity (Obradović et. al., forthcoming) and may also influence the nature of warmth and support received from others (Liu, 2003). The relation between interpersonal relationships and internalizing problems is not likely to be unidirectional, but rather reciprocal and transactional (Garber, 2006).

The current study explores the etiology and development of internalizing problems among rural poor adolescents in China, and how support in family and school settings can
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support psychological adjustment. This represents a step towards developing explanatory models, interventions and policy grounded in a firm understanding of the phenomenology of mental health among children and adolescents in disadvantaged areas of the developing world. Luthar and colleagues (2006) emphasize concentrating attention on risk and protective factors that are salient to children and youths’ particular life context, are malleable and amenable to interventions, are enduring throughout development, and are generative of cascading effects across domains. As China’s economic and social development continue to gallop forward at astonishing speed, China’s youth will continue to experience the impact of shifting responsibilities, pressures and expectations. Researchers must maintain a broad vision and focus on the developmental needs of adolescents, and the support that adults and institutions can provide.
Table A1. Items used in construction of cumulative adversity index.

<table>
<thead>
<tr>
<th>Item type</th>
<th>Items included in index</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Academic</strong></td>
<td>Leaving school within past 4 years, repeating a grade within past 4 years, low grades in past year, extended low grades in past 3 years, disciplinary action at school in past 4 years, sibling leaving school in past 4 years, peer conflict at school in past year</td>
</tr>
<tr>
<td><strong>Family structure</strong></td>
<td>Mother dying in past 4 years, father dying in past 4 years, sibling dying in past 4 years, moving into a different household in past 4 years, moving out of the family home into a school dorm in past 4 years, father migrating for work in past 4 years, mother migrating for work in past 4 years</td>
</tr>
<tr>
<td><strong>Health</strong></td>
<td>Self becoming disabled in past 4 years, Mother becoming disabled in past 4 years, Father becoming disabled in past 4 years, Self having chronic illness, Mother having chronic illness, Father having chronic illness, Mother having recent depressive feelings, Self having general poor health in past year, Father having general poor health in past year, Self being hospitalized in past year, Sibling being hospitalized in past year</td>
</tr>
<tr>
<td><strong>Economic</strong></td>
<td>Family having insufficient income in past year, Family experiencing food insecurity in past year</td>
</tr>
</tbody>
</table>

Table A2. Items used in construction of parental warmth and teacher support scales.

<table>
<thead>
<tr>
<th>I) Parental warmth (response categories are never, sometimes, often)</th>
<th>If you have done something wrong, your parents will ask you to explain the reason and discuss with you the correct way to do it.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>If you have done something wrong, your parents will point it out.</td>
</tr>
<tr>
<td></td>
<td>Your parents encourage you to work hard at everything.</td>
</tr>
<tr>
<td></td>
<td>Your parents always talk with you good naturedly and gently.</td>
</tr>
<tr>
<td></td>
<td>Your parents encourage you to think independently</td>
</tr>
<tr>
<td></td>
<td>When your parents ask you to do something, they tell you why.</td>
</tr>
<tr>
<td></td>
<td>When your school performance is poor, your parents encourage you to study harder.</td>
</tr>
<tr>
<td></td>
<td>Your parents like to talk to you.</td>
</tr>
<tr>
<td></td>
<td>When you feel unhappy, your parents easily notice.</td>
</tr>
<tr>
<td></td>
<td>If you do not agree with your parent’s opinions they are willing to allow you to speak out your own idea.</td>
</tr>
<tr>
<td></td>
<td>Your parents often ask about your homework.</td>
</tr>
<tr>
<td></td>
<td>Your parents know what you do after school.</td>
</tr>
<tr>
<td></td>
<td>Your parents know who your friends are.</td>
</tr>
<tr>
<td></td>
<td>Your parents talk to you about things that interest you.</td>
</tr>
<tr>
<td></td>
<td>Your parents praise you or say “thank you”.</td>
</tr>
<tr>
<td></td>
<td>Your parents show affection by hugging you or patting you.</td>
</tr>
<tr>
<td></td>
<td>Your parents tend to keep in touch with your teachers</td>
</tr>
<tr>
<td>II) Teacher support (response categories are totally disagree, disagree, agree, fully agree)</td>
<td>If I study hard, the teacher will praise me.</td>
</tr>
<tr>
<td></td>
<td>The teacher often pays attention to me in class.</td>
</tr>
<tr>
<td></td>
<td>Most teachers like to listen to me talk.</td>
</tr>
<tr>
<td></td>
<td>The teaching quality at my school is very good.</td>
</tr>
<tr>
<td></td>
<td>The teachers at my school care a lot about the students.</td>
</tr>
<tr>
<td></td>
<td>Teachers at our school treat students very fairly.</td>
</tr>
<tr>
<td></td>
<td>The teacher encourages us to ask questions.</td>
</tr>
<tr>
<td></td>
<td>Teachers like me.</td>
</tr>
</tbody>
</table>

2 All items were included, unweighted, in the cumulative adversity index.
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REFERENCES


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### Table 1: Descriptive statistics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Means (SD)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internalizing problem scale</td>
<td>30.96(5.80)31.33(5.64)</td>
<td>Range is from 15-54, composite child report of items measuring internalizing problems</td>
</tr>
<tr>
<td><strong>Independent variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adversity Index</td>
<td>2.18(1.77)2.19(1.79)</td>
<td>Number of recent stressful life events (see appendix 1 for index items. Range is 0-11. Events are not child-reported.)</td>
</tr>
<tr>
<td>High adversity</td>
<td>20.13(.40)19.06(.39)</td>
<td>Percentage of sample with 4 or more recent stressful life events</td>
</tr>
<tr>
<td>Parental warmth</td>
<td>41.04(6.51)40.52(6.78)</td>
<td>Range is from 0-54, child report of parental warmth scale</td>
</tr>
<tr>
<td>Teacher support</td>
<td>33.72(5.53)33.84(4.69)</td>
<td>Range is from 0-44, child report of teacher support scale</td>
</tr>
<tr>
<td>Age thirteen¹</td>
<td>21.95 22.12</td>
<td>Percentage of thirteen-year-old children in the sample</td>
</tr>
<tr>
<td>Age fourteen</td>
<td>31.56 30.67</td>
<td>Percentage of fourteen-year-old children in the sample</td>
</tr>
<tr>
<td>Age fifteen</td>
<td>27.66 26.40</td>
<td>Percentage of fifteen-year-old children in the sample</td>
</tr>
<tr>
<td>Age sixteen²</td>
<td>18.83 20.81</td>
<td>Percentage of sixteen-year-old children in the sample</td>
</tr>
<tr>
<td>Prior Internalizing problems</td>
<td>33.39(6.74)33.61(7.01)</td>
<td>Internalizing problem scale score from 2000</td>
</tr>
<tr>
<td>Log of family wealth in 2000</td>
<td>9.17(.93)9.25(.91)</td>
<td>Composite variable for wealth. Range is from 4.74-12.08</td>
</tr>
<tr>
<td>Mother’s education (in years)</td>
<td>4.28(3.43)4.59(3.47)</td>
<td>Range is 0-13</td>
</tr>
<tr>
<td>Log of village per capita inc.</td>
<td>7.13(.91)7.19(.89)</td>
<td>Range is from 3.40 to 9.21</td>
</tr>
<tr>
<td>Village middle sch. grad. rate</td>
<td>32.03 33.59</td>
<td>Percentage of villagers in the work force who graduated from middle school. Range is from 4.36 to 86.80</td>
</tr>
<tr>
<td>Girls</td>
<td>45.75 54.25</td>
<td>Percentage of the sample that is female</td>
</tr>
<tr>
<td>Boys</td>
<td></td>
<td>Percentage of the sample that is male</td>
</tr>
<tr>
<td>Total N</td>
<td>1659 1659</td>
<td></td>
</tr>
</tbody>
</table>

Source: Gansu Survey of Children and Families, 2000, 2004. ¹Age 13 contains a small number of respondents aged 11 (n=3) and 12 (n=7). ²Age 16 contains a small number of respondents aged 17 (n=9) and 18 (n=2).
### Table 2. RE GLS Estimated Effects for the Regression of Internalizing Problems on Selected Characteristics of Adolescents in Gansu Province

<table>
<thead>
<tr>
<th></th>
<th>Model A</th>
<th>Model B</th>
<th>Model C</th>
<th>Model D</th>
<th>Model E</th>
<th>Model F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>-.391</td>
<td>-.397</td>
<td>-.399</td>
<td>-.531</td>
<td>-.383</td>
<td>-.371</td>
</tr>
<tr>
<td></td>
<td>(.28)</td>
<td>(.279)</td>
<td>(.279)</td>
<td>(.353)</td>
<td>(.275)</td>
<td>(.274)</td>
</tr>
<tr>
<td>Log of family wealth in 2000</td>
<td>.017</td>
<td>-.019</td>
<td>.018</td>
<td>.016</td>
<td>-.008</td>
<td>-.003</td>
</tr>
<tr>
<td></td>
<td>(.163)</td>
<td>(.167)</td>
<td>(.168)</td>
<td>(.168)</td>
<td>(.164)</td>
<td>(.164)</td>
</tr>
<tr>
<td>Mother's education (in years)</td>
<td>-.008</td>
<td>.083</td>
<td>.006</td>
<td>.007</td>
<td>.016</td>
<td>.011</td>
</tr>
<tr>
<td></td>
<td>(.043)</td>
<td>(.044)</td>
<td>(.044)</td>
<td>(.044)</td>
<td>(.043)</td>
<td>(.043)</td>
</tr>
<tr>
<td>Internalizing problem score in 2000</td>
<td>.021</td>
<td>.022</td>
<td>.022</td>
<td>.021</td>
<td>.017</td>
<td>.014</td>
</tr>
<tr>
<td></td>
<td>(.021)</td>
<td>(.021)</td>
<td>(.021)</td>
<td>(.021)</td>
<td>(.020)</td>
<td>(.020)</td>
</tr>
<tr>
<td>Age fourteen (reference = age 13)</td>
<td>.555</td>
<td>.540</td>
<td>.532</td>
<td>.529</td>
<td>.469</td>
<td>.458</td>
</tr>
<tr>
<td></td>
<td>(.388)</td>
<td>(.388)</td>
<td>(.387)</td>
<td>(.387)</td>
<td>(.381)</td>
<td>(.380)</td>
</tr>
<tr>
<td>Age fifteen (reference = age 13)</td>
<td>.948*</td>
<td>.921*</td>
<td>.922*</td>
<td>.921*</td>
<td>.904*</td>
<td>.864*</td>
</tr>
<tr>
<td></td>
<td>(.403)</td>
<td>(.403)</td>
<td>(.402)</td>
<td>(.403)</td>
<td>(.396)</td>
<td>(.394)</td>
</tr>
<tr>
<td>Age sixteen (reference = age 13)</td>
<td>1.854***</td>
<td>1.799***</td>
<td>1.780***</td>
<td>1.776***</td>
<td>1.598***</td>
<td>1.545***</td>
</tr>
<tr>
<td></td>
<td>(.438)</td>
<td>(.438)</td>
<td>(.438)</td>
<td>(.438)</td>
<td>(.431)</td>
<td>(.429)</td>
</tr>
<tr>
<td>Village per capita income</td>
<td>.394~</td>
<td>.426*</td>
<td>.419*</td>
<td>.477*</td>
<td>.465*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.0203)</td>
<td>(.0202)</td>
<td>(.0202)</td>
<td>(.194)</td>
<td>(.193)</td>
<td></td>
</tr>
<tr>
<td>Village middle school graduation rate</td>
<td>-.023*</td>
<td>-.022*</td>
<td>-.022*</td>
<td>-.022*</td>
<td>-.021*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.010)</td>
<td>(.010)</td>
<td>(.010)</td>
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<tr>
<td>High adversity</td>
<td>.804*</td>
<td>.789*</td>
<td>.704*</td>
<td>.689~</td>
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<td>(.363)</td>
<td>(.364)</td>
<td>(.357)</td>
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<tr>
<td>High adversity*female</td>
<td>-.431</td>
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<tr>
<td></td>
<td>(.708)</td>
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<tr>
<td>Parental warmth</td>
<td></td>
<td></td>
<td></td>
<td>-.749**</td>
<td>-.070**</td>
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<td></td>
<td></td>
<td></td>
<td>(.024)</td>
<td>(.024)</td>
<td></td>
</tr>
<tr>
<td>Teacher support</td>
<td></td>
<td></td>
<td></td>
<td>-.179***</td>
<td>-.195***</td>
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<tr>
<td>parental warmth*teacher support</td>
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<td></td>
<td></td>
<td>-.016***</td>
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<td>(.004)</td>
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<tr>
<td>Intercept</td>
<td>32.02***</td>
<td>29.92***</td>
<td>29.89***</td>
<td>29.94***</td>
<td>29.48***</td>
<td>29.64***</td>
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<td>Number of village clusters</td>
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<tr>
<td>Within R²</td>
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<td>.013</td>
<td>.015</td>
<td>.015</td>
<td>.046</td>
<td>.053</td>
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<tr>
<td>Between R²</td>
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<td>.081</td>
<td>.090</td>
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<td>.056</td>
<td>.064</td>
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<td>Fraction of variance due to random effects</td>
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<td>.020</td>
<td>.019</td>
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<td>Wald χ²</td>
<td>21.56**</td>
<td>28.29***</td>
<td>33.29***</td>
<td>33.70***</td>
<td>93.27***</td>
<td>107.36***</td>
</tr>
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</table>

Source: GSCF 2000, 2004.  \(^p<0.1; * p<.05; ** p<.01; *** p<.001\)
Figure 1. Predicted internalizing problems as a function of protective factors for a 14 year-old female with high adversity (n=1659)
ADVERSITY, INTERNALIZING, AND SUPPORT IN GANSU

Figure 2. Average internalizing problems by age and gender in Gansu Province

Figure 3. Internalizing problem score by gender and adversity in Gansu Province