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“Making it”: Understanding adolescent resilience in two informal settlements (slums) in Nairobi, Kenya

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Abstract

Many adolescents living in contexts characterized by adversity achieve positive outcomes. We adopt a protection-risk conceptual framework to examine resilience (academic achievement, civic participation, and avoidance of risk behaviors) among 1,722 never-married 12-19 year olds living in two Kenyan urban slums. We find stronger associations between explanatory factors and resilience among older (15-19 years) than younger (12-14 years) adolescents. Models for pro-social behavior and models for anti-social behavior emerge as key predictors of resilience. Further accumulation of evidence on risk and protective factors is needed to inform interventions to promote positive outcomes among youth situated in an ecology of adversity.

Keywords

Resilience; Risk and Protective Factors; Adolescents; Kenya; Slums

Adolescents growing up in resource-poor settings are at heightened risk for negative behavioral and psychological outcomes including risky sexual behavior (Dodoo, Zulu, & Ezech, 2007; Ngom, Magadi, & Owuor, 2003; Zulu, Dodoo, & Ezech, 2002), substance use (Mugisha, Arinaitwe-Mugisha, & Hagembe, 2003), delinquency, and violence (Blum et al., 2000). Yet, many adolescents “make it,” that is, progress successfully through adolescence despite living in such adverse conditions. In other words, they are resilient in spite of the odds against them. Understanding the factors that are associated with resilience among these adolescents can shed light on mechanisms for promoting wellbeing among youth in such high-risk settings. In this article, we draw on a risk-protection conceptual framework to examine factors that are associated with positive academic and behavioral outcomes among a sample of 12-19 year olds living in two urban slums in Nairobi, Kenya’s capital city.

Defining “resilience”

We adopt Fergus and Zimmerman’s (2005) definition of resilience as the “process of overcoming the negative effects of risk exposure, coping successfully with traumatic experiences, and avoiding the negative trajectories associated with risks” (p.399). Common elements in the operationalization of resilience are the presence of risk or adversity and of protective factors that enable a person to successfully cope, adapt, or overcome risks and achieve positive outcomes (Buckner, Mezzacappa, & Beardslee, 2003; Fergus & Zimmerman, 2005; Olsson, Bond, Burns, Vella-Brodrick, & Sawyer, 2003; Tiet & Huizinga, 2002). Simply put, resilience refers to successful adaptation in risk settings. Fergus and Zimmerman (2005) note that protective or promotive factors, which enhance the likelihood of positive outcomes, can be either *assets*, that is, individual characteristics that enhance positive outcomes, or *resources*, that is, attributes of the social environment that enable an individual to surmount adversity. For example, parental monitoring, an attribute of the social environment, has been linked to non-engagement in risk behavior (e.g., smoking and drinking) among adolescents in the US and in Kenya (Mistry, McCarthy, Yancey, Lu, & Patel, 2009; Ngom et al., 2003).

In this study, we delineate three positive or pro-social outcomes in our operationalization of resilience: academic achievement, participation in civic activities (including voluntary community service), and non-engagement in delinquent behavior, substance use, or early sexual intercourse. Academic achievement and low levels of risk behavior have been used elsewhere as measures of resilience (Buckner et al., 2003; Jessor, 1993; Tiet & Huizinga, 2002). Existing literature suggests that civic participation may be protective against risk behaviors (Nicholson, Collins, & Holmer, 2004; Weitzman & Kawachi, 2000). Some scholars also suggest that civic organizations may reflect social cohesion within the community which may be protective (Larson, 2000; Roth, Brooks-Gunn, Murray, & Foster, 1998; Sampson & Wilson, 1995). Involvement in civic activities may also expose youth to positive role models and keep them engaged in constructive activities that reduce the likelihood of delinquent behavior (Denault & Poulin, 2009).

We argue that these pro-social outcomes are appropriate markers of successful adaptation in the study context given the low educational opportunities (APHRC, 2008) and high levels of risk behavior (Dodoo et al., 2007; Mugisha et al., 2003; Ngom et al., 2003; Zulu et al., 2002) that characterize urban slums in Kenya. Living in a context characterized by widespread deprivation, few educational and livelihood opportunities, high rates of violence, and weak social ties increases the chances that young slum dwellers will have poor academic and behavioral outcomes.

Conceptual framework

Given the linkages between resilience, and protective or promotive factors and risk factors, we apply a well-established protection-risk conceptual framework, Jessor’s problem behavior theory (Costa et al., 2005; Jessor, 1991; Jessor, Turbin, & Costa, 1998a; Jessor et al., 2003; Jessor, van Den Bos, Vanderryn, Costa, & Turbin, 1995), to examine variation in resilience among adolescents living in Nairobi’s urban slums. To the best of our knowledge, only a handful studies (Ndugwa et al., 2011) have adopted a protection-risk theoretical framework to examine adolescent behavior in urban slums in a sub-Saharan African context. The framework outlines three types of protective factors (models protection, controls protection, and support protection) and three types of risk factors: models risk, opportunity risk, and vulnerability risk (Jessor et al., 2003). Theoretically, protective factors promote positive, pro-social or health-enhancing behavior while risk factors increase the probability of engaging in risk behaviors. The framework also posits that protective factors can

moderate the impact of exposure to risk. While risk and protective factors are often inversely related, the framework posits them as orthogonal, that is, high protection can co-occur with high risk, and low protection with low risk (Jessor et al., 1995). Below we briefly describe the sets of protective and risk factors used in this study.

Models protection includes measures of parent and peer models for pro-social behavior (e.g., having friends who are committed to doing well in school). Controls protection includes individual-level (e.g., religiosity) or social environment-level (e.g., parental monitoring) measures of informal regulatory controls. Support protection refers to contextual supports at the peer, family, school and other social environments that promote pro-social or health enhancing behavior (e.g., being in a school where teachers are willing to spend extra time helping students).

Models risk includes measures of models for unconventional or health-compromising behavior (e.g., household members who are alcohol dependent may serve as behavioral models for children and adolescents who live in the same household). Opportunity risk refers to exposure to or access to situations that increase the likelihood of engaging in risk behaviors (e.g., selling drugs may provide an opportunity to engage in drug use). Lastly, vulnerability risk refers to individual characteristics that increase the likelihood of engaging in risk behavior (e.g., low perceived life chances, low self-esteem, and experiencing adverse life events may heighten the likelihood of engaging in risk behavior).

Although the conceptual framework was developed in the United States (US), it has now been successfully applied cross-nationally and within very different societies and cultures (Jessor, 2008). For example, in a study examining the cross-national generality of the framework in China and the US, Jessor and colleagues (2003) observed that, while the Chinese and American adolescents differed on mean levels of the descriptive and theoretical measures, the predicted associations between the theoretical constructs and the problem behaviors were similar across the two societies. Vazsonyi and colleagues (2008) tested the applicability of the problem behavior conceptual framework in explaining engagement in alcohol and drug use as well as delinquent behavior, such as theft and vandalism, among adolescents in Georgia and Switzerland. Overall, their findings showed that the conceptual model fit the data from both the Georgian and the Swiss samples. And, in a more recent study, Vazsonyi and colleagues (2010) tested the extent to which the framework explained variation in problem behavior involvement (vandalism, school misconduct, general deviance, as well as theft and assault) among adolescents from eight cross-national settings in Asia, Eastern and Western Europe, North America, and Eurasia. They again observed wide similarities across the eight countries in the linkages of the risk and protective factors with problem behavior involvement.

The problem behavior theory framework has also been used to explain variation in pro-social and health-enhancing behaviors (Jessor, Turbin, & Costa, 1998b; Turbin et al., 2006). Thus, the model provides a useful framework for explaining why some adolescents living in high risk settings nevertheless achieve positive educational and behavioral outcomes. Indeed, previous work on resilience among adolescents delineates several characteristics that distinguish resilient from non-resilient youth. Buckner and colleagues (2003) observed that low-income youths in the US reporting high self-esteem, high parental monitoring and high self-regulation were more likely to be resilient. In another study, also in the US, investigating the association between risk and protective factors and successful outcomes among socio-economically disadvantaged adolescents, Jessor, Turbin, and Costa (1998b) reported that, under similar conditions of high risk, adolescents with high levels of protective factors (in particular, an intolerant attitude toward deviance, a positive orientation to health and fitness, and peer models for pro-social behavior) were more likely to be

resilient. However, the extent to which these findings hold true for adolescents living in resource-poor settings in sub-Saharan Africa is unknown.

The unique context of urban informal (slum) settlements in Nairobi

Urban slums provide a unique context in which to study resilience among adolescents. With increasing rates of urbanization coupled with unstable economies, many low income countries have been unable to provide basic services to meet the demands of urban populations. This has led to the growth of large informal settlements (slums) in many cities in the developing world that epitomize the characteristics of poverty. In spite of the hardships faced by slum dwellers, informal settlements continue to grow because they offer close proximity to industries that depend heavily on casual laborers and, in addition, provide a cheap housing option for new migrants to the city. In Nairobi, slums house over half of the city's population of over 3 million people. Incidentally, children, women and adolescents are heavily represented amongst the poor for social, cultural, biological, economic and political reasons. Indeed, majority of the residents of Nairobi's slums (over 50%) are children and adolescents aged 24 years or younger (UN-HABITAT, 2008a).

The United Nations Human Settlements Programme (UN-HABITAT) defines a slum household as "a group of individuals living under the same roof that lack one or more of the following conditions: access to safe water; access to sanitation; secure tenure; durability of housing; and sufficient living area" (UN-HABITAT, 2003). Based on this definition, a place is defined as a slum area if "half or more of all households lack improved water, improved sanitation, sufficient living area, durable housing, secure tenure, or combinations thereof" (UN-HABITAT, 2008b). Slums in Nairobi typify this phenomenon. These slums are characterized by poor housing and sanitation, weak or non-existent infrastructure, a lack of basic services such as education and health care, high unemployment rates, and high rates of violence. Disparities in transition from primary to secondary school are also evident. For example, a recent study shows that while 90% of children living in low income, but non-slum areas in Nairobi transition from primary to secondary school, only 40% of their counterparts living in slums do so (APHRC, 2008). Limited formal education and employment opportunities (World Bank, 2008) mean that young people living in these deprived communities are prone to involvement in crime, violence, and risky behaviors such as alcohol and drug use, as well as risky sexual behaviors that place them at heightened risk for sexually transmitted infections, unwanted pregnancies, and poor health and social outcomes.

By 2050 most developing nations will be predominantly urban, (UN-HABITAT, 2008b) governments must therefore, find ways to address challenges faced by urban populations. Addressing these challenges is part of the government's obligations to ensure that citizens' rights to better health, education, human dignity, and sanitation are met. For example, the country has embarked on a second generation poverty reduction strategy termed *Vision 2030* that aims at social, political and economic equity, growth and development that guarantees Kenyans their right to a 'decent' life. Attention to adolescents who 'make it' in spite of their disadvantaged surrounding adds a different dimension to the formulation of policies to address social problems in urban areas. Jessor (1993) states that focusing on successful adaptation and associated processes "suggests that a social policy agenda should be concerned not only with the reduction of risk but with the strengthening of protection as well" (p. 121). Mohaupt (2008) also notes that emphasizing strengths over 'deficits' enhances intervention uptake among the target population because of its positive orientation.

The present study

The present study examines the association between protective and risk factors and positive or pro-social developmental outcomes, what we are terming resilience, using data collected from 12-19 year adolescents living in two Nairobi slums. Given that appropriate behavior is dictated by “age-graded norms and age-related expectations,” (Costa, 2008) we conduct our analysis separately for younger (12-14 years) and older (15-19) adolescents. Indeed, studies show large differences between age cohorts in substance use and sexual behavior between younger and older adolescents (Resnick et al., 1997). The distinction between these two periods — earlier and later adolescence — is also important because of other age-related developmental changes. For example, as noted by Greenberger and Chen (1996), early adolescence is a highly stressful period marked by oft-confusing pubertal changes, the transition from primary to secondary school, changes in parent-child relationships, and increased pressure to conform to peer norms and expectations.

Jessor’s protection-risk conceptual framework was used to articulate protective factors and risk factors at both the individual level and in the social context. Our main hypothesis is that resilience — here, a composite index measuring academic achievement, participation in civic activities, and non-engagement in delinquent behavior, substance use, or early sexual intercourse — will be positively associated with measures of theoretical constructs of protection, and negatively associated with theoretical constructs of risk. In addition, we hypothesize that protective factors will moderate the impacts of exposure to risk. Finally, given the greater variation in prevalence of involvement in risk behavior likely in the older age-cohort, it is expected that a greater amount of variation in resilience will be explained in the analyses based on data from the older adolescents.

Method

Study design

This article is based on data drawn from two separate but overlapping studies conducted among adolescents living in two slums in Nairobi — Korogocho and Viwandani: The Transitions to Adulthood (TTA) study and the Education Research Program (ERP). Further details on these studies are provided elsewhere (APHRC, 2006; Ndugwa et al., 2011). Both studies are nested in the larger Nairobi Urban Health and Demographic Surveillance System (NUHDSS), which collects longitudinal health and demographic data from households in the two slums. By the end of 2009, the NUHDSS included about 73,000 individuals living in about 26,000 households. Ethical approvals for the NUHDSS, TTA, and ERP are granted by the Kenya Medical Research Institute. All respondents in the ERP and TTA must provide informed consent prior to the interview. For respondents aged 12-17 years, parental consent is also required.

As both studies are nested in the NUHDSS, it is possible to merge data collected from the same adolescent individual under the two different studies. We therefore merged data from Wave 1 of the TTA and Wave 4 of the ERP project, both collected in the same year, in order to draw on the rich information about the school context and adolescent risk behavior collected under the ERP and the detailed information on protective and risk factors collected under the TTA project. During the first wave of the TTA study (November 2007 - June 2008), 4,057 adolescents (50% males) aged 12-22 were interviewed in the TTA study. The fourth wave of data collection in the ERP project was conducted between October 2007 and May 2008, a period coinciding with the first wave of the TTA project. During the fourth wave, 5,239 adolescents (52% male) aged 12-22 completed a child behavior survey. We successfully matched data from 2,014 youth of whom 1,722 (86%) were never-married, 12-19 year olds. We find that compared to youth not interviewed in both studies, adolescents

in the merged sample have resided in the slums longer, are younger (thus less mobile), and are more likely to live in Korogocho, whose population is less mobile than that in Viwandani (Beguy, Bocquier, & Zulu, 2010). We find no difference based on sex distribution.

Participants

Table 1 summarizes the socio-demographic and behavioral characteristics of the 1,722 never-married, 12-19 year old participants in the merged sample by age cohort. Approximately 45% of adolescents were aged 12-14 years. Fifty-three percent of adolescents were males. About 93% and 77% of younger and older adolescents, respectively, were living with both or one parent. The median household size was 5 with a median number of adolescents of 2 per household. The median duration of stay in the study area was 13 years. On average, residents of Korogocho had lived in the slums longer than their peers in Viwandani (not shown in the tables). About 80% of adolescents participated in civic activities. The majority (87%) of adolescents had never had sex. Just over 50% had never engaged in delinquent behavior.

Measures

Measuring resilience—Resilience was assessed as a composite index based on five behavioral criteria that capture academic achievement, participation in civic activities (including voluntary community service), and non-engagement in delinquent behavior, substance use, or early sexual intercourse. Academic achievement is defined as being in school at the time of survey with performance in school rated as *excellent* or *good* by the parent/guardian, or as being out of school but having completed secondary school or college. Participation in civic activities includes involvement in clubs and/or community service. For substance use and sexual behavior, we assess whether an adolescent has ever smoked, drank alcohol, used recreational drugs, or ever had early sexual intercourse. With respect to sexual behavior, an adolescent is scored as resilient if first intercourse occurs at 18 years (the age of legal adulthood in Kenya) or older. This cut-off age also takes into account the median age at first sexual intercourse (approximately 18 years) based on data from the 2008-09 Kenyan Demographic and Health Survey (Kenya National Bureau of Statistics (KNBS) & ICF Macro, 2010) and preliminary analyses of the timing of first sex in the TTA study. A continuous resilience index (Cronbach's $\alpha=0.56$) was constructed using standardized values of 24 individual items all scored in the positive (resilient) direction using Stata's (Stata, 2007) 'standardize' function. Ninety-six percent of respondents had complete information for all resilience items, fewer than 4% had missing information on one item, and less than 1% had missing information on two or more items. For those with missing data on individual items, we imputed the resilience index measure using available information.

Measuring protective factors and risk factors—Three types of protective factors were assessed: models protection, controls protection, and support protection. Internal consistency of scores on the variable scales was assessed using Cronbach's α (Crocker & Algina, 1986). For each type of protective factor, a composite score was generated from standardized values of individual items. Table 2 summarizes the protective factor measures, including their alpha reliabilities and sample items. The models protection scale (4 items) (Cronbach's $\alpha=0.64$) measured perceived models among friends for four pro-social behaviors: academic achievement, participation in extra-curricular activities in school, attending religious services, and aspiring to higher education. Controls protection was measured using two subscales: social controls, and individual controls protection. The social controls protection subscale, a 14-item composite (Cronbach's $\alpha = 0.83$), assessed parental monitoring and perceived peer sanctions for transgressions. The individual controls protection subscale included 13 items (Cronbach's $\alpha = 0.66$) from four scales that

measured individual self-regulation: religiosity, positive attitude towards schooling, perceived ability to resist peer pressure, and conservative attitudes regarding sexual behavior. Support protection refers to the presence of a supportive environment; the support protection scale (26 items) (Cronbach's alpha = 0.86) assessed perceived parental, teacher, and peer support.

Three types of risk factors were assessed: models risk, vulnerability risk, and opportunity risk. The models risk measure (14 items) (Cronbach's alpha = 0.73) assessed models for risk behavior in three social contexts: family, peers, and school. The vulnerability risk index (21 items) (Cronbach's alpha = 0.83) assessed low self-esteem, low perceived life chances, adverse life experiences, and perceived peer pressure to engage in sex. Less than two percent of adolescents had sold or delivered drugs or alcohol, the two measures of opportunity risk. Thus, opportunity risk was dropped from further analyses.

Measuring socio-demographic and behavioral characteristics—Several sociodemographic measures were obtained for descriptive purposes and for use as controls in multi-variate analyses: sex, parental co-residence, household size, study site, and duration of living in the study area. Parental co-residence comprised three categories: living alone or with non-parents, living with both parents, or living with one parent only (see Table 1).

Analyses

To explore expected age-related differences in the role of protective and risk factors, all analyses were conducted by age cohort. Correlation coefficients were computed to assess linear relationships among the theoretical predictors and between them and the resilience index (see Table 3). Since the composite resilience index was negatively skewed, the Stata “*lnskew0*” command, which adds a constant and then performs a log transformation, was used to create a normally-distributed logged resilience outcome variable. Using multi-variate linear regression, we examined the associations between protective and risk factors in the conceptual framework and the log-transformed resilience criterion measure, controlling for sociodemographic characteristics. In the first regression model, only sociodemographic variables were entered. In the second model, the theoretical predictors were added. A third model added all eight risk $\times$ protective factor interactions since the explanatory framework specifies that protective factors can moderate exposure to the impact of risk. Interaction terms were computed using mean-centered theoretical measures. We also run models (not shown) with interactions between gender and all the theoretical predictors to determine whether the findings were general across sex. None of the six gender interactions was significant for the younger cohort, and there was only one among the older cohort. Since some households had more than one adolescent, models were adjusted using Stata's ‘cluster’ option.

Results

Bi-variate analyses

As expected, protective factor measures were all positively correlated with other protective factor measures, risk factor measures were positively correlated with each other, and protective factor measures were negatively correlated with risk factor measures in both age cohorts. As Table 3 illustrates, these correlations were considerably stronger among the older cohort. As theoretically expected, the bi-variate correlations between the theoretical measures of protection and the resilience criterion index were in the positive direction, while the risk factor measures were negatively correlated with resilience. Although only the correlations of the individual controls protection measure and of the models risk measure

with resilience were significant in the younger age cohort, all correlations were statistically significant in the older cohort.

Multi-variate analyses

Table 4 presents regression coefficients from the multi-variate linear regression models by age group. Sociodemographic factors alone (Model 1) accounted for 2% of the variance in resilience among 12-14 year olds. Among the younger group of adolescents, living alone had a significant negative weight compared to living with both parents. The addition of the theoretical predictors accounted for an additional 7% of the variance. Both the models protection and the models risk measures had significant coefficients (Models 2-3). In addition, the social controls protection measure had a marginally significant coefficient at the 0.10 level.

Among the older cohort, sociodemographic factors accounted for 7% of the variance in resilience. Among older adolescents, females relative to males scored higher on the resilience index (Models 4-6), and increasing length of stay in the slums was associated with lower resilience. Adding the theoretical predictors accounted for an additional 10% of the variance. As with the younger adolescents, the models protection and the models risk measures were significantly associated with the resilience criterion (Models 5-6).

Among younger adolescents, there was no significant risk $\times$ protection interaction. Among older adolescents, however, there was a marginally significant interaction between the social controls protection measure and the vulnerability risk measure, with social controls protection moderating the impact of vulnerability risk on resilience. To illustrate this interaction effect, we followed the procedure described in Aiken and West (1991) to generate an interaction plot (Figure 1). The figure shows that the impact of high vulnerability on resilience is buffered or attenuated by high social controls protection, as theoretically expected.

Discussion

Despite living under high-risk circumstances, a significant proportion of adolescents growing up in urban slums show resilience, that is, they manage to stay in and do well in school and avoid engagement in risk behaviors. This paper used cross-sectional data to examine resilience among never-married, adolescents living in two Kenyan urban slums. To the best of our knowledge, this is the first application of a well-established protection-risk conceptual framework — Jessor's problem behavior theory — to examine resilience among adolescents living in urban slums in sub-Saharan Africa.

The bi-variate analyses revealed the theoretically-expected, directional relationships between protective and risk factors, on the one hand, and resilience, on the other, with protective factors being positively correlated with resilience, and risk factors being negatively correlated with resilience. The multi-variate account of variation in resilience was 17% in the older cohort and 11% in the younger cohort, with both accounts being significant. These findings are consistent with those of Jessor and colleagues (2003) and Costa and associates (2005) in their application of the same conceptual framework to account for the association of protective and risk factors with involvement in problem behaviors among Chinese and American adolescents. The multi-variate analyses accounted for lower levels of variance than other studies (Jessor et al., 2003). This may stem, in part, from shared variance among predictors, and use of a less exhaustive set of measures since our study is based on data that were neither collected to examine resilience nor to test the problem behavior theory.

Among the theoretical predictors, models protection and models risk are consistently associated with resilience and in both cohorts. The importance of models, especially peer models, in shaping adolescent behavior is consistent with previous evidence. Indeed, increased identification with peer groups is a key characteristic of adolescence (Haffner, 1998) and a focus on the importance of peers and other models as points of reference in shaping young people's values, attitudes, and practices is emphasized in several approaches (Baranowski, Perry, & Parcel, 2002; Dishion & Owen, 2002; Mirande, 1968; Montano & Kasprzyk, 2002). This finding that models emerge as the key predictors of resilience in circumstances of adversity makes clear that resilience reflects not only individual or personality attributes, but also social context factors (Fergus & Zimmerman, 2005; Schoon, Parsons, & Sacker, 2004). The programmatic and policy implications suggested are that efforts to enhance resilience among adolescents in disadvantaged urban settings need to make models for risk behavior less salient, while enhancing models for positive, pro-social behavior. Further research is warranted to understand modalities for achieving this in a context characterized by weak social ties as well as high exposure to violence, crime, and risky behaviors, such as alcohol and drug use.

The difficulty of establishing moderator effects in field studies is well-known (McClelland & Judd, 1993). Although, the moderating effect of social controls protection on the association of vulnerability risk (low self esteem, low perceived life chances, adverse life experiences, and perceived peer pressure to engage in sex) with resilience, observed among the older adolescents was only marginally significant, the suggested interaction illustrates the potential moderating effect of protection on risk. At high levels of vulnerability risk, adolescents with high social controls protection, that is, adolescents perceiving greater parental monitoring and greater peer disapproval for risk behavior are more resilient than those with low social controls protection. While further evidence on the role of informal social controls in regulating risk behavior and promoting pro-social behavior is clearly needed, this finding suggests that encouraging greater parental involvement in monitoring children's activities may be an important tool for achieving positive outcomes among young people living in urban slums.

The fact that the findings are notably stronger for the older cohort than for the younger cohort is of problematic interest. A possible reason for the observed age-cohort difference in amounts of variation explained by the multi-variate analysis is, as noted earlier, the greater prevalence of and variation in risk behavior involvement among older adolescents. It may also be possible that the theoretical measures, especially the protective factors, such as parental social controls, play a somewhat different, more regulatory role at a later than at an earlier developmental stage. Further, if we consider resilience as a process that develops over time — in other words, a person gains critical skills such as self-control over time — then we can expect wider variations in resilience among older adolescents who have had time to develop their own capacity to adapt to risk settings. Pursuing these alternatives would be facilitated by longitudinal research.

Several limitations in the present research need acknowledgement. First, the index measure of resilience is limited to only five behaviors and omits other potential components of positive adjustment such as mental health (Tiet & Huizinga, 2002). A more comprehensive mapping of the resilience construct would make the findings more compelling. Second, the index relied on a binary criterion of engagement versus non-engagement in the three risk behaviors, rather than on continuous measures that could take into account frequency and quantities consumed (in the case of substance use). Third, the cross-sectional study design, of course, precludes causal inferences about the effects of the protective and risk factors on the resilience outcome measure; instead, the study relies upon directional associations that are consonant with theoretical expectations. Only longitudinal analyses, with time-extended

data, can strengthen inferences about causal influence. Finally, given the sensitive nature of information sought from participants, we must be cognizant of possible self-report bias.

Policy and Program Implications

These limitations notwithstanding, the study has illuminated key protective and risk factors that may contribute to positive development among youth living in poor urban settlements in sub-Saharan Africa. In particular, study findings highlight the need to involve parents as informal social control agents in programs designed to address youth risk behavior, empowerment and well-being. Study findings also underscore the need for policies and programs to ensure that young people living in resource-poor urban neighborhoods have access to education and recreational services as well as opportunities for civic involvement that address local needs and ensure that young people are pro-socially engaged. While government is primarily responsible for providing such services, public-private partnerships should be explored. Further accumulation of evidence on positive youth development can provide a more compelling rationale for interventions to promote positive outcomes for young people growing up in an ecology of adversity. This is especially critical given an increasing rate of urbanization in the region that is rarely matched with improvements in living conditions, educational and livelihood opportunities, and social services.

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References

- African Population and Health Research Center.. Handbook for analysis of ERP data - Version 1.1. African Population and Health Research Center; Nairobi, Kenya: 2006.
- African Population and Health Research Center (APHRC).. Policy and program issues emerging from APHRC's education research in urban informal settlements of Nairobi, Kenya. African Population and Health Research Center; Nairobi: 2008.
- Aiken, LS.; West, SG. Multiple regression: Testing and interpreting interactions. Sage; Newbury Park, London: 1991.
- Baranowski, T.; Perry, CL.; Parcel, GS. How individuals, environment, and health behavior interact: Social cognitive theory. In: Glanz, K.; Rimer, BK.; Lewis, FM., editors. Health Behaviors and Health Education: Theory, Research, and Practice. Jossey-Bass; San Francisco: 2002. p. 165-184.
- Beguy D, Bocquier P, Zulu EM. Circular migration patterns and determinants in Nairobi slum settlements. Demographic Research. 2010; 23(20):549–586.
- Blum RW, Beuhring T, Shew ML, Bearinger LH, Sieving RE, Resnick MD. The effects of race/ethnicity, income, and family structure on adolescent risk behaviors. American Journal of Public Health. 2000; 90(12):1879–1884. [PubMed: 11111260]
- Buckner JC, Mezzacappa E, Beardslee WR. Characteristics of resilient youths living in poverty: the role of self-regulatory processes. Development and Psychopathology. 2003; 15(1):139–162.
- Costa, FM. [Retrieved October 27, 2010] Problem-Behavior Theory - A Brief Overview. 2008. http://www.colorado.edu/ibs/jessor/pb_theory.html
- Costa FM, Jessor R, Turbin MS, Dong Q, Zhang H, Wang C. The role of social contexts in adolescence: Context protection and context risk in the United States and China. Applied Developmental Science. 2005; 9(2):67–85.

- Crocker, L.; Algina, J. Introduction to classical and modern test theory. Wadsworth; Belmont, CA: 1986.
- Denault A-S, Poulin F. Intensity and breadth of participation in organized activities during the adolescent years: Multiple associations with youth outcomes. *Journal of Youth and Adolescence*. 2009; 38(9):1199–1213. [PubMed: 19669900]
- Dishion TJ, Owen LD. A longitudinal analysis of friendships and substance use: bidirectional influence from adolescence to adulthood. *Developmental Psychology*. 2002; 38(4):480–491. [PubMed: 12090479]
- Dodoo FN, Zulu EM, Ezeh AC. Urban-rural differences in the socioeconomic deprivation-sexual behavior link in Kenya. *Social Science & Medicine*. 2007; 64:1019–1031. [PubMed: 17113695]
- Fergus S, Zimmerman MA. Adolescent resilience: A framework for understanding healthy development in the face of risk. *Annual Review of Public Health*. 2005; 26(1):399–419.
- Greenberger E, Chen C. Perceived family relationships and depressed mood in early and late adolescence: A comparison of European and Asian Americans. *Developmental psychology*. 1996; 32(4):707–716.
- Haffner DW. Facing facts - Sexual health for American adolescents. *Journal of Adolescent Health*. 1998; 22:453–459. [PubMed: 9627815]
- Jessor R. Risk behavior in adolescence: A psychosocial framework for understanding and action. *Journal of Adolescent Health*. 1991; 12(8):597–605. [PubMed: 1799569]
- Jessor R. Successful adolescent development among youth in high-risk settings. *American Psychologist*. 1993; 48(2):117–126. [PubMed: 8442567]
- Jessor R. Description versus explanation in cross-national research on adolescence. *Journal of Adolescent Health*. 2008; 43(6):527–528. [PubMed: 19027639]
- Jessor R, Turbin MS, Costa FM. Protective factors in adolescent health behavior. *Journal of Personality and Social Psychology*. 1998a; 75(3):788–800. [PubMed: 9781412]
- Jessor R, Turbin MS, Costa FM. Risk and protection in successful outcomes among disadvantaged adolescents. *Applied Developmental Science*. 1998b; 2(4):194–208.
- Jessor R, Turbin MS, Costa FM, Dong Q, Zhang H, Wang C. Adolescent problem behavior in China and the United States: A cross-national study of psychosocial protective factors. *Journal of Research on Adolescence*. 2003; 13(3):329–360.
- Jessor R, van Den Bos J, Vanderryn J, Costa FM, Turbin MS. Protective factors in adolescent problem behavior: Moderator effects and developmental change. *Developmental Psychology*. 1995; 31(6): 923–933.
- Kenya National Bureau of Statistics (KNBS).. ICF Macro.. Kenya Demographic and Health Survey 2008-09. KNBS and ICF Macro; Calverton, Maryland: 2010.
- Larson RW. Toward a psychology of positive youth development. *American Psychologist*. 2000; 55(1):170–183. [PubMed: 11392861]
- McClelland GH, Judd CM. Statistical difficulties of detecting interactions and moderator effects. *Psychological Bulletin*. 1993; 114:376–390. [PubMed: 8416037]
- Mirande AM. Reference group theory and adolescent sexual behavior. *Journal of Marriage and Family*. 1968; 30(4):572–577.
- Mistry R, McCarthy WJ, Yancey AK, Lu Y, Patel M. Resilience and patterns of health risk behaviors in California adolescents. *Preventive Medicine*. 2009; 48(3):291–297. [PubMed: 19159644]
- Mohaupt S. Review article: Resilience and social exclusion. *Social Policy & Society*. 2008; 8(1):63–71.
- Montano, DE.; Kasprzyk, D. The theory of reasoned action and the theory of planned behavior. In: Glanz, K.; Rimer, BK.; Lewis, FM., editors. *Health Behavior and Health Education: Theory, Research, and Practice*. Jossey-Bass; San Francisco: 2002.
- Mugisha F, Arinaitwe-Mugisha J, Hagembe BON. Alcohol, substance and drug use among urban slum adolescents in Nairobi, Kenya. *Cities*. 2003; 20(4):231–240.
- Ndugwa R, Kabiru C, Cleland J, Beguy D, Egondi T, Zulu E, et al. Adolescent Problem Behavior in Nairobi's Informal Settlements: Applying Problem Behavior Theory in Sub-Saharan Africa. *Journal of Urban Health*. 2011; 88(Supplement 2):298–317.

- Ngom P, Magadi MA, Owuor T. Parental presence and adolescent reproductive health among the Nairobi urban poor. *Journal of Adolescent Health*. 2003; 33:369–377. [PubMed: 14596958]
- Nicholson HJ, Collins C, Holmer H. Youth as people: The protective aspects of youth development in after-school settings. *Annals of the American Academy of Political and Social Science*. 2004; 591(1):55–71.
- Olsson CA, Bond L, Burns JM, Vella-Brodrick DA, Sawyer SM. Adolescent resilience: A concept analysis. *Journal of adolescence*. 2003; 26(1):1–11. [PubMed: 12550818]
- Resnick MD, Bearman PS, Blum RW, Bauman KE, Harris KM, Jones J, et al. Protecting adolescents from harm: Findings from the National Longitudinal Study on Adolescent Health. *JAMA-journal of the American Medical Association*. 1997; 278(10):823–832.
- Roth J, Brooks-Gunn J, Murray L, Foster W. Promoting healthy adolescents: Synthesis of youth development program evaluations. *Journal of Research on Adolescence*. 1998; 8(4):423–459.
- Sampson, RJ.; Wilson, WJ. Toward a theory of race, crime and urban inequality. In: Hagan, J.; Peterson, RD., editors. *Crime and inequality*. Stanford University Press; Stanford, CA: 1995. p. 37-54.
- Schoon I, Parsons S, Sacker A. Socioeconomic adversity, educational resilience, and subsequent levels of adult adaptation. *Journal of Adolescent Research*. 2004; 19:383–404.
- Stata.. *Stata Statistical Software*. (Version 10). StataCorp LP; College Station, TX: 2007.
- Tiet QQ, Huizinga D. Dimensions of the construct of resilience and adaptation among inner-city youth. *Journal of Adolescent Research*. 2002; 17(3):260–276.
- Turbin MS, Jessor R, Costa FM, Dong Q, Zhang H, Wang C. Protective and risk factors in health-enhancing behavior among adolescents in China and the United States: Does social context matter? *Health Psychology*. 2006; 25(4):445–454. [PubMed: 16846319]
- UN-HABITAT.. *The Challenge of Slums: Global Report on Human Settlements*. 2003.
- United Nations Human Settlements Programme (UN-HABITAT).. *The State of African Cities 2008 - A framework for addressing urban challenges in Africa*. UN-HABITAT; Nairobi: 2008a.
- United Nations Human Settlements Programme (UN-HABITAT).. *State of the World's Cities 2008/2009 - Harmonious Cities*. UN-HABITAT; Nairobi: 2008b.
- Vazsonyi AT, Chen P, Jenkins DD, Burcu E, Torrente G, Sheu C-J. Jessor's problem behavior theory: Cross-national evidence from Hungary, the Netherlands, Slovenia, Spain, Switzerland, Taiwan, Turkey, and the United States [Advance online publication]. *Developmental Psychology*. 2010 doi: 10.1037/a0020682.
- Vazsonyi AT, Chen P, Young M, Jenkins D, Browder S, Kahumoku E, et al. A test of Jessor's problem behavior theory in a Eurasian and a Western European developmental context. *Journal of Adolescent Health*. 2008; 43(6):555–564. [PubMed: 19027643]
- Weitzman ER, Kawachi I. Giving means receiving: The protective effect of social capital on binge drinking on college campuses. *American Journal of Public Health*. 2000; 90(12):1936–1939. [PubMed: 11111272]
- World Bank.. [Retrieved April 13, 2010] *Kenya Poverty and Inequality Assessment (Volume 1: Synthesis Report) - Draft Report (44190-KE)*. 2008. www.hackkenya.org
- Zulu EM, Dodoo FN, Ezeh AC. Sexual risk-taking in the slums of Nairobi, Kenya, 1993-98. *Population studies*. 2002; 56(3):311–323. [PubMed: 12553329]

Figure 1. The moderator effect of social controls protection on the relationship between vulnerability risk and resilience among 15-19 year olds

Table 1
Demographic and behavioral characteristics by age cohort

	12-14 years	15-19 years	Total
	n=780	n=942	N=1 722
<i>Demographic characteristics</i>			
Study site			
Korogocho	47.8%	57.2%	53.0%
Viwandani	52.2%	42.8%	47.0%
Sex			
Male	50.8%	54.6%	52.9%
Female	49.2%	45.4%	47.2%
Parent co-residence			
Stay alone or with no parents	7.1%	23.5%	16.0%
One parent	27.3%	28.5%	27.9%
Both parents	65.6%	48.1%	56.0%
Median HH size (range)	5 (2-14)	5 (1-15)	5 (1-15)
Median number of adolescents in HH (range)	2 (1-8)	2 (1-9)	2 (1-9)
Median duration of stay in study area in years (range)	12 (1-14)	15 (0-19)	13 (0-19)
<i>Behavioral characteristics</i>			
Academic achievement			
Low	30.1%	49.0%	40.5%
High	69.9%	51.0%	59.5%
Participates in civic activities	84.0%	76.3%	79.8%
Never drank alcohol or used other drugs	96.3%	84.2%	89.7%
Never had sex	96.5%	78.8%	86.8%
Never engaged in delinquent behavior	52.6%	52.3%	52.4%

^a HH=household

Table 2
Description of Protective and Risk Factor Measures

Measures	# of items	alpha	Sample items	Response options
<i>Protective factor measures</i>				
Models protection	4	0.64	How many of your friends get good marks in school?	1 (None of Them) to 4 (All of Them)
Social controls protection	14	0.83	How much would you say your parents/guardian really knows about...where you spend time in the evenings?	1 (Never) to 3 (Always)
Individual controls protection	13	0.66	How important is it to you to rely on religious teaching when you have a problem?	1 (Not Important) to 4 (Very Important)
Support protection	26	0.86	How often does your father try to help you when you need something?	1 (Never) to 5 (All the Time)
<i>Risk factor measures</i>				
Models risk	14	0.73	Have any of your brothers or sisters ever smoked or do any currently smoke cigarettes	1 (Yes), 2 (No)
Vulnerability risk	21	0.83	On the whole, how satisfied are you with yourself?	1 (Very satisfied) to 4 (Not satisfied at all)

Table 3
Correlations among resilience index, protective factors, and risk factors, by age group

	12-14 years (n=780)						15-19 years (n=942)					
	R	MP	SCP	ICP	SP	MR	R	MP	SCP	ICP	SP	MR
Resilience ^a (R)	1.00						1.00					
Models protection (MP) ^b	0.08	1.00					0.21 [*]	1.00				
Social controls protection (SCP) ^b	0.09	0.14 [*]	1.00				0.14 [*]	0.22 [*]	1.00			
Individual controls protection (ICP) ^b	0.12 [*]	0.01	0.20 [*]	1.00			0.20 [*]	0.24 [*]	0.29 [*]	1.00		
Support protection (SP) ^b	0.06	0.03	0.11	0.18 [*]	1.00		0.16 [*]	0.22 [*]	0.18 [*]	0.23 [*]	1.00	
Models risk (MR) ^c	-0.28 [*]	-0.03	-0.11 [*]	-0.26 [*]	-0.14 [*]	1.00	-0.36 [*]	-0.31 [*]	-0.27 [*]	-0.30 [*]	-0.25 [*]	1.00
Vulnerability risk (VR) ^c	-0.03	-0.12 [*]	-0.40 [*]	-0.18 [*]	-0.08	0.10	-0.19 [*]	-0.24 [*]	-0.38 [*]	-0.31 [*]	-0.24 [*]	0.31 [*]

^a Increasing values reflect greater resiliency

^b Increasing values reflect higher protection

^c Increasing values reflect higher risk

^{*} p<.05 (two-tailed)

Table 4
Regression of log-transformed resilience index on protective and risk factors, by age group

	12-14 years			15-19 years		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	<i>B</i> [95% CI] ^d	<i>B</i> [95% CI] ^d	<i>B</i> [95% CI] ^d	<i>B</i> [95% CI] ^d	<i>B</i> [95% CI] ^d	<i>B</i> [95% CI] ^d
<i>Sociodemographics</i>						
Viwandani (ref: Korogocho)	-0.117** [-0.022,-0.235]	-0.120** [-0.014,-0.256]	-0.110** [-0.005,-0.245]	-0.055 [0.025,-0.153]	-0.007 [0.064,-0.097]	-0.012 [0.061,-0.105]
Female (ref: male)	0.058* [0.110,-0.007]	0.038 [0.093,-0.030]	0.036 [0.092,-0.034]	0.161*** [0.188,0.126]	0.148*** [0.177,0.110]	0.147*** [0.178,0.109]
Household size	-0.014 [0.009,-0.039]	-0.011 [0.011,-0.034]	-0.012 [0.010,-0.035]	-0.008 [0.010,-0.027]	-0.01 [0.007,-0.029]	-0.011 [0.006,-0.030]
Living arrangements (ref: both parents)						
Alone or others	-0.238** [-0.026,-0.564]	-0.194** [-0.004,-0.483]	-0.169* [0.009,-0.436]	-0.161** [-0.030,-0.336]	-0.029 [0.068,-0.160]	-0.025 [0.072,-0.158]
One parent	-0.029 [0.056,-0.141]	0.000 [0.078,-0.102]	-0.002 [0.077,-0.104]	-0.111** [-0.011,-0.240]	-0.046 [0.039,-0.154]	-0.053 [0.034,-0.165]
Number of adolescents in household	-0.011 [0.021,-0.047]	-0.010 [0.021,-0.045]	-0.011 [0.021,-0.046]	0.022 [0.052,-0.010]	0.023 [0.051,-0.007]	0.023 [0.051,-0.007]
Duration of stay in slum	0.001 [0.010,-0.008]	0.002 [0.011,-0.006]	0.003 [0.012,-0.005]	-0.010*** [-0.003,-0.016]	-0.006** [-0.000,-0.012]	-0.006* [0.000,-0.012]
<i>Theoretical predictors</i>						
Models protection ^a		0.061** [0.102,0.012]	0.059** [0.102,0.008]		0.041** [0.076,0.001]	0.040* [0.075,-0.001]
Social controls protection ^a		0.077* [0.135,-0.000]	0.063 [0.125,-0.017]		-0.014 [0.040,-0.077]	-0.017 [0.038,-0.082]
Individual controls protection ^a		0.028 [0.103,-0.072]	-0.001 [0.084,-0.116]		0.028 [0.078,-0.032]	0.007 [0.065,-0.063]
Support protection ^a		-0.034 [0.038,-0.125]	-0.032 [0.040,-0.123]		0.010 [0.065,-0.056]	0.01 [0.067,-0.060]
Models risk ^b		-0.497*** [-0.301,-0.746]	-0.440*** [-0.252,-0.682]		-0.331*** [-0.214,-0.470]	-0.315*** [-0.199,-0.455]
Vulnerability risk ^b		0.029 [0.099,-0.064]	0.059 [0.125,-0.030]		-0.092** [-0.007,-0.196]	-0.065 [0.019,-0.170]
<i>Protection × risk interactions</i>						
^c						
Social controls protection × vulnerability risk		--	--			0.067* [0.128,-0.014]
R ²	0.023	0.096	0.113	0.071	0.167	0.174
N	780	780	780	942	942	942

Note: ref = reference

^aIncreasing values reflect higher protection

^bIncreasing values reflect higher risk

^cOnly significant interactions are shown

^d Back-transformed coefficients, 95% confidence intervals in parentheses

*
p<0.10,

**
p<0.05,

p<0.01 (p-values are two-tailed)