What is the Relationship between Cognitive and Non-Cognitive Skills and the Adoption of Risk Behavior in Peru?

Pablo Lavado, Carla Aragón and Magally Gonzales*

Universidad del Pacífico, Lima

Abstract

For many years, research has dealt with the relationship between the adoption of risk behaviors by teenagers and factors related to the family or the environment, ignoring other factors such as teenagers' own cognitive or non-cognitive skills. This study seeks to demonstrate the relationship between these two variables and ascertain whether adolescents' cognitive and non-cognitive skills are negatively associated with the consumption of tobacco and alcohol and the early initiation of sexual activity. The investigation used Peru's Young Lives database and employed two estimation methods: fixed effects and instrumental variables. The results show that the relationship between risk behaviors and cognitive and non-cognitive skills is negative. That is, adolescents with higher levels of intelligence, self-esteem, and self-efficacy are less likely to engage in risky behaviors.

Keywords: adolescents skills; risk behavior; intelligence; self-esteem; Peru.

---

* Article received on November 29, 2014; final version approved on March 30, 2015.
The authors would like to thank Diego Winkelried and Karlos La Serna for their comments throughout this study.
Pablo Lavado Padilla holds a Ph.D. and a Master's degree in Economics from the Centro de Estudios Monetarios y Financieros (CEMFI) in Madrid. He is a professor in the Department of Economics at the Universidad del Pacífico, and a researcher in the Centro de Investigación at that university.
Email: P.LavadoPadilla@up.edu.pe
Carla Aragón Peñaloza is an undergraduate student of Economics at the Universidad del Pacífico.
Email: aragonpcp@gmail.com
Magally Gonzales Macetas is an undergraduate student of Economics at the Universidad del Pacífico.
Email: aragonpcp@gmail.com

Vol. XLII, N° 76, First Semester 2015: pages 59-93 / ISSN 0252-1865

Acronyms used

ENDES	Demographic and Family Health Survey (Encuesta Demográfica y de Salud Familiar)
GED	General Educational Development Test
PPVT	Peabody Picture Vocabulary Test
SD	Standard deviation
YLS	Young Lives Study

INTRODUCTION

Risk behaviors are those that jeopardize an individual's physical and psychological health, as well as his or her social life (OMS 1998; Jessor 1991). The most common of these are: use of illegal drugs such as cannabis, cocaine, and ecstasy; and early initiation of sexual activity.

An ever-increasing number of young people engage in risk behaviors of one kind or another at an earlier age. In Peru, the average age of first-time licit and illicit drug use is 13 (OPD 2009)[1]; meanwhile, 6% of females have their first sexual encounter before the age of 15 (INEI 2012).[2] In turn, the prevalence of legal drug use among adolescents in 2009 was 28.9%, which is to say that 534,931 adolescents had consumed alcohol or tobacco (OPD 2009);[3] finally, the prevalence of illegal drug use that same year was 4.6% (OPD 2009).

The literature demonstrates a relationship between the socioeconomic characteristics of adolescents and their propensity to engage in a risk behavior of one type or another. However, two points are being overlooked. On the one hand, the relationship between socioemotional skills (perseverance, extroversion, and self-esteem, among others) and engagement in risk behaviors has been little studied (Heckman and Cunha 2007). On the other hand, the relationships considered in previous studies do not necessarily represent causal effects.

The primary objective of this study is to estimate the marginal contribution of cognitive and socioemotional skills to decisions by adolescents to engage in one of the following types of risk behavior (Heckman and Kautz 2012): tobacco use, alcohol use, or early sexual initiation.[4] A second objective is to estimate the causal effect of cognitive and socioemotional skills on the likelihood of engaging in risk behaviors, using panel data.

---

1. According to the *III Estudio nacional: prevención y consumo de drogas en estudiantes de secundaria* a study conducted in 2009 by the Peruvian Drug Observatory (Observatorio Peruano de Drogas, OPD), the age at which young people in Peru start to engage in a risk behavior of one kind or another is between 13 and 17. It should be noted that this study was only conducted in urban areas.
2. The Demographic and Family Health Survey (Encuesta Demográfica y de Salud Familiar, Endes) is a survey conducted by Peru's National Institute of Statistics and Informatics (Instituto Nacional de Estadística e Informática, INEI).
3. *Estudio nacional de prevención y consumo de drogas en estudiantes de secundaria* (OPD 2009).
4. Legal drug use (tobacco and alcohol) and early sexual initiation are studied, both for the case of adolescents. Illegal drug use was discarded on the grounds that, of the adolescents evaluated in Round 3 of the YLS through a questionnaire self-administered by each adolescent, 91.31% of the total sample answered that they had not consumed illicit drugs and only 2.69% stated that they had. The lack of variability between one group and the other precludes consistent estimation, so it was decided not to include this risk behavior in the study.

The contribution of this study is twofold. First, it is the first of its kind to estimate the effect of socioemotional skills on engagement in risk behaviors. Most studies on risk behavior among adolescents are centered on explaining the adoption of these behaviors due to family or contextual factors[5] and have overlooked the influence that individual factors such as cognitive and socioemotional skills may have on making such a decision (Cueto *et al.* 2011). Cognitive skills are defined as a child's capacity to develop mathematically, verbally, and in reading comprehension, and also includes individual personality traits such as self-esteem and self-efficacy.[6] Individuals are endowed with cognitive and socioemotional skills at birth, which are accumulated or diminished throughout the life cycle based on a range of factors such as the parent-child relationship, early stimulation received, type of school attended, and extracurricular activities undertaken, among others (Heckman and Cunha 2007). These skills influence the decisions adolescents make, including to engage in risk behavior.

The second contribution responds to the fact that few studies have investigated this issue, and instead centered their analysis on the relationship between a specific risk behavior and just one skill type. Moreover, these studies do not estimate causal relationships. The availability of a panel database of cognitive and socioemotional skills affords the opportunity to estimate causal relationships, which is the objective of this study.

The database employed is from the Young Lives Study (YLS).[7] The Young Lives project constitutes a long-term study in four developing countries: Ethiopia, India, Peru, and Vietnam, with a view to understanding the causes and consequences of child poverty and, in turn, to designing and implementing public policies aimed at reducing it.

This study follows the lives of two groups of children in each country: 2,000 children born between 2001 and 2002 (younger cohort) and 714 children born between 1994 and 1995 (older cohort), and applies rounds of questionnaires to the children and their main caregivers. Three rounds of questionnaires have been conducted to date, in 2002, 2006, and 2009. This study focuses on the Peruvian case. It employs only Rounds 2 and 3 of the

5. Such as household structure, parents' level of education, family background, religion, parent-child communication, physical abuse in the family, and socioeconomic level, among others.
6. Self-esteem determines how an individual values him/herself, while self-efficacy measures an individual's control over his/her life; that is, a self-efficacious person believes that the results of his/her actions are due to individual effort and not to factors such as luck, destiny, or outside intervention (Dercon and Sánchez 2011).
7. The database of the Young Lives Study in Peru can be found at: <http://www.ninosdelmilenio.org> (also at: <www.younglives.org.uk>).

questionnaire and works only with children from the older cohort, who were 11 years old during Round 2 and between 14 and 15 years old during Round 3. Each of the rounds has a final sample of 670 observations.

This paper is divided into five sections. The first section presents a review of the literature; the second sets out the databases used, as well as their characteristics; the third presents the econometric strategy selected to verify the hypotheses designed; and the fourth shows the results obtained using the econometric model. Finally, the fifth section sets out the conclusion and policy recommendations and proposes future studies that could be undertaken.

1. DETERMINANTS OF RISK BEHAVIOR

The determinants of risk behaviors can be approached from three perspectives: behavioral economics; classical economics; and developmental psychology (National Bureau of Economic Research, 2001).

The first approach, that of behavioral economics, analyzes an adolescent's actions based on psychological tools and the logic of utility maximization. Thus, an individual's behavior is determined by two factors; the "passions" that prompt a person to act on impulse, and an "impartial spectator" that acts as a conscience. Both aspects encompass the feelings, knowledge, and preferences of each individual (Ashraf *et al.* 2005). Thus, an increase in the risk perceived by an individual can cause one of two reactions: abstinence or indulgence (O'Donogue and Rabin 2000). The difference between reacting in one way or the other depends on the person taking the action. That is, an individual who has previously indulged in a risk behavior has already assumed all of the costs associated with that activity (passion), and the marginal cost of further engagement will therefore be increasingly less. This is not true of an individual who has yet to indulge in a risk behavior, as in this case the cost of doing so is greater (impartial spectator).

The second approach is that of classical economics and posits that engagement in risk behavior is the result of a utility maximization process by an adolescent with respect to legal and illegal drug use and engagement in sexual relations. This approach is based on the theory of rational addiction (Becker and Murphy 1988).

Finally, the third approach is that of developmental psychology. This approach holds that the factors that influence the adoption of risk behavior arise out of three spheres: family, context, and personal, which in turn influence an individual's cognitive, emotional, and social development.

The **family** sphere is perhaps that which most influences an adolescent's decision to engage in a risk behavior. This is because the factors that make up this sphere exert their presence in each stage of an adolescent's formation. The most important factors include: the household structure and its relationship with alcohol consumption, as in the case studied by Stroup-Benham *et al.* of Mexican-American single mothers and their children (1990); the absence of one parent, as a consequence of which Blum *et al.* find an increase in alcohol and tobacco use among adolescents in the 7th to 12th grade in the United States (2000); moreover, protective actions against early sexual initiation of adolescents, which are associated with parents being married and the existence of good family relations according to Anteghini *et al.* (2001).

Other important factors in this sphere are parental monitoring of their children's activities and the level of communication between parents and children. Of course, the former is associated with less engagement by adolescents in sexual behavior and alcohol use (Cottrell *et al.* 2007), and the latter is correlated to lower rates of alcohol consumption. (Vincent *et al.* 2005).

The second sphere is the **context**; that is, the place or location where the adolescent functions. The fundamental component of this sphere is socioeconomic, a factor that derives from the family environment but whose consequences have an important relationship to the reality that surrounds the adolescent. Low-income individuals, because of their economic circumstances, are found to be more likely to live in areas where drug addiction and violence are entrenched (Verner and Cardoso 2007).

Finally, the sphere on which this paper focuses is that of the **individual** and concerns the cognitive and socioemotional skills possessed by an adolescent. The former (measured in the study by Cueto et al. by means of the Peabody Picture Vocabulary Test [PPVT][8]) are negatively associated with the adoption of risk behaviors. That is, an adolescent who obtains a better score on the PPVT is less likely to adopt a risk behavior of any type (Cueto *et al.* 2011). Moreover, Weiland *et al.* (2014), in a study on substance abuse among young adults, find a negative relationship between total gray matter[9] and the early use of substances such as alcohol and other drugs.

8. This study only employs the PPVT as a measure of cognitive skills.
9. Gray matter can be considered as a gauge of cognitive skills, as it is responsible for processing the information received by the brain.

In a study more closely aligned to the objectives of this one, it was found that socioemotional (or non-cognitive) skills also have a negative relationship on the adoption of risk behavior (Heckman and Kautz 2012), based on comparisons between three types of individuals: those who graduated from high school, those who dropped out, and those who dropped out but opted to take the General Educational Development test (GED).[10] The databases used for this study were NSLY79, NSLY97, and NELS and the results show that those students who passed the GED, in contrast to those who graduated from high school, are most vulnerable to the adoption of risk behavior, despite being recognized as having the same cognitive level as the latter group.

The difference between students who passed the GED and those who graduate from high school is due to factors such as socioemotional skills because, despite their shared cognitive characteristics, there are different results for the two student types. It should be noted that the authors reach this conclusion by measuring the risk behavior adopted by each type of individual, as they do not use a specific variable to measure socioemotional skills. Finally, Wang *et al.* (2009) find that self-esteem constitutes a protective factor against risk behavior among young adolescents.

None of the abovementioned studies estimate the effect that socioemotional skills have on the likelihood of engaging in risk behavior, and one of the contributions of this study is to estimate this causal relationship using panel data.

2. DATABASE AND SAMPLE

As mentioned earlier, the database from the Young Lives Study is used in this analysis. Table 1 presents descriptive statistics of the most important variables from both rounds. It can be seen that, on average, those adolescents who have not consumed tobacco or had sexual relations have higher levels of both cognitive and socioemotional skills.

10. The GED test is used in the USA to accredit students who drop out of high school with the same cognitive level as those who graduate.

Table 1
Descriptive Statistics, Young Lives Study

Variables	Round 2		Round 3							
	Complete sample		Complete sample		Consumes tobacco? Mean		Consumes alcohol? Mean		¿Had sexual relations? Mean	
	Mean	SD	Mean	SD	Yes	No	Yes	No	Yes	No
- PPVT raw score	72.424	16.745	96.712	17.157	94.970	98.242	99.051	96.895	93.444	98.514
- Mathematics raw score	5.753	1.776	13.211	5.634	12.437	13.760	14.064	13.244	11.630	13.956
- Index of self-efficacy	14.711	1.279	18.174	2.061	17.874	18.327	18.167	18.245	18.043	18.267
- Index of self-esteem	15.307	3.099	19.107	2.576	19.074	19.166	18.941	19.230	18.907	19.184
- The adolescent's friends consume tobacco*	-	-	0.526	0.500	0.785	0.456	0.755	0.405	0.674	0.488
- The adolescent's friends consume alcohol*	-	-	0.656	0.476	0.807	0.614	0.937	0.501	0.733	0.636
- The adolescent's friends have had sexual relations*	-	-	0.622	0.486	0.802	0.543	0.746	0.517	0.872	0.529
- Adolescent's age (in months)	147.757	5.745	178.676	4.122	179.470	178.455	179.155	178.419	179.429	178.504
- Index of wealth	0.503	0.223	0.584	0.185	0.583	0.593	0.613	0.582	0.574	0.595
- Adolescent's relationship with parents	8.310	2.337	16.347	5.938	15.039	16.745	15.800	16.804	15.189	16.686
- Adolescent's level of education	5.907	1.115	8.834	1.191	8.754	8.914	9.030	8.813	8.475	8.979
Number of observations	670		670		135	501	221	413	140	505

Note
* The information on the risk behaviors adopted by adolescents and their peers is available starting from Round 3 of the YLS.

In the case of adolescents who consume alcohol, this behavioral pattern is only found in relation to non-cognitive skills; those who have already started their sex life have a lower score for skills of this type than the overall average for the sample; finally, adolescents who have not engaged in any of these behaviors enjoy better relationships with their parents than those who have. The peer effects measurement also differs between these two types of individuals.

3. RISK BEHAVIORS AND COGNITIVE AND SOCIOEMOTIONAL SKILLS

3.1 Risk behaviors

In this section, we will analyze three risk behaviors in adolescents:[11] tobacco use, alcohol use, and early sexual initiation. It should be mentioned that these variables are only found in Round 3 of the YLS for the older cohort and were retrieved through a confidential self-administered questionnaire; this means that no questions were directly asked by an interviewer – each adolescent completed the questionnaire autonomously, in an area separate from the staff in charge, and handed it in in a sealed envelope. The application of the questionnaire required the verbal consent of each participant (Cueto *et al.* 2011).

It was decided to make the questionnaire confidential because of the sensitive nature of the issues raised, which are frequently stigmatized by adolescents. Its confidential and self-reported character constitutes an effort to reduce the likelihood of blank responses and bias in answers predicated on what adolescents think is socially acceptable, as well as to increase the likelihood of truthful responses, which are highly unlikely in face-to-face interviews. Finally, it serves to reduce potential bias or partiality on the part of the interviewer (YLS 2011a).

The confidential questionnaire covers questions on the adolescent's relationship with his/her parents and the impact that this has on risk behaviors. These include: abuse of an adolescent by peers, tobacco use, practice of sexual relations, access to information on sex and contraceptive methods, drug use, depression, and firearm possession.[12]

3.2 Cognitive and socioemotional skills

Cognitive and socioemotional skills are covered by the questions in Rounds 2 and 3, for the older cohort of the YLS.

11. The variables used to measure risk behaviors are in Annex 1, Table 1A.
12. For information on how the indicators of legal drug use and sexual relations are constructed, see Annex 2.

Cognitive skills

In recent years, the application of standardized tests that measure cognitive skills has become a very common practice in developing countries, as they are considered indicators of success in education and the acquisition of knowledge for adult life (YLS 2011b).

Cognitive skills are measured through the following tests:[13] the PPVT, the Cloze test, and a mathematics test. The PPVT[14] is a widely-used receptive vocabulary test in which a series of images are presented to participants, who are required to select the one that best represents the word spoken to them. A number of studies have found that the PPVT has a strong positive correlation with commonly used measures of intelligence, such as the Wechsler and McCarthy scales (Campbell *et al.* 2001; Gray *et al.* 1999; Campbell 1998). Meanwhile, the Cloze test measures (verbal) reading comprehension skills. Participants are asked to read out a short sentence or paragraph that is missing one or more words. Participants have to demonstrate knowledge of vocabulary and comprehension of a situation by inserting a word to complete a sentence or paragraph. Finally, the mathematics test measures participants' mathematical skills, requiring them to solve basic operations and problems (Cueto and León 2012).

Socioemotional skills

To measure socioemotional or non-cognitive skills, two indicators were constructed: the self-esteem and self-efficacy indices.[15] Both self-esteem and self-efficacy are notions that have been validated by the psychological literature, as they correlate with an adolescent's economic and social achievements in his/her adult life. Self-esteem assesses how an individual values him/herself, while self-efficacy measures an individual's control over his/her life; that is, whether a person believes that the results of his/her actions are due to individual effort and not to factors such as luck, destiny, or the intervention of others (Dercon and Sánchez 2011).

The indices are constructed based on the degree to which each adolescent agrees with statements related to personality traits, such as self-esteem and self-efficacy, measured using Likert's 5-point scale.[16]

---

13. The variables used to measure cognitive skills are found in Annex 1, Table 1B.
14. In Peru, the Spanish-language version of the PPVT (PPVT-R) is employed, which consists of a single form containing 125 items, as compared to the 204 in the PPVT form used in other countries (PPVT-III-A).
15. The variables used to measure cognitive skills are found in Annex 1, Table 1C.
16. The Likert scale has a "neutral" option for when an adolescent cannot respond to a statement. The other four options used in the Likert scale are: "Strongly agree," "agree," "disagree," and "strongly disagree." A 5-point scale is broadly recommended, by Likert (1932), DeVellis (2003), and Nunally and Bernstein (1994).

To measure self-esteem,[17] the statements used are centered on positive and negative dimensions of pride and shame based on the Rosenberg self-esteem scale, with a focus on the adolescents' everyday circumstances. To measure self-efficacy,[18] statements are employed that relate to the adolescents' decision-making about their lives.

The statements on pride and shame and auto-efficacy were psychometrically validated (Leight 2008, taken from YLS 2009b) and were employed in subsequent studies, such as those of Boyden (2008), Dercon and Sánchez (2008), and Yamada *et al.* (2013). Given that one concept taken into account when psychological tests are employed is "internal consistency," that is, the reliability and homogeneousness of the results, an *alpha* of 0.7035 is obtained for the indicators of self-esteem and self-efficacy in the sample employed.[19]

4. EMPIRICAL STRATEGY

Since the objective of this study is to estimate the effect of cognitive and socioemotional skills on the adoption of three types of risk behavior (tobacco use, alcohol use, and sexual initiation), the equations to be estimated are:

Tobacco use:

$$ta_{it} = \beta_0 + \beta_1 C_i + \beta_2 NC_i + \beta_3 X_{it} + \mu_{it} \quad (1)$$

Alcohol use:

$$al_{it} = \alpha_0 + \alpha_1 C_i + \alpha_2 NC_i + \alpha_3 X_{it} + \varepsilon_{it} \quad (2)$$

Sexual initiation:

$$rs_{it} = \phi_0 + \phi_1 C_i + \phi_2 NC_i + \phi_3 X_{it} + \omega_{it} \quad (3),$$

17. See Annex 3, Table 3A.
18. See Annex 3, Table 3B.
19. According to Cronbach (1951), in a homogeneous psychological test, the statements must all measure the same thing. Cronbach's alpha is a statistic based on the correlation between various elements of a single test. A sufficiently high alpha (0.70 or more) implies that there is a common factor in the responses to the different statements (Dercon and Sánchez 2011).

where i is the individual, t is the period of time, C_i represents latent cognitive skills, NC_i latent socioemotional skills, and X_{it} the remaining control variables. Skills are described as latent insofar as they go unobserved by the econometrician but are known by the individual. It should be noted that they only depend on the individual and not on time; that is, latent skills remain constant in time. The objective of this study is to estimate: β_1, β_2, α_1, α_2 and ϕ_1, ϕ_2; that is, the effect of latent cognitive and socioemotional skills on the likelihood of engaging in a risk conduct.

Because latent skills are not observed by the econometrician, the estimation of these models is usually carried out using proxy variables; that is, tests that measure both cognitive and socioemotional skills (Yamada *et al.* 2013; Dercon and Sánchez 2011). Thus, the regressions to be estimated would be as follows:

Tobacco use:

$$ta_{it} = \tilde{\beta}_0 + \tilde{\beta}_1 IC_{it} + \tilde{\beta}_2 INC_{it} + \tilde{\beta}_3 X_{it} + \tilde{\mu}_{it} \quad (4)$$

Alcohol use:

$$al_{it} = \tilde{\alpha}_0 + \tilde{\alpha}_1 IC_{it} + \tilde{\alpha}_2 INC_{it} + \tilde{\alpha}_3 X_{it} + \tilde{\varepsilon}_{it} \quad (5)$$

Sexual initiation:

$$rs_{it} = \tilde{\phi}_0 + \tilde{\phi}_1 IC_{it} + \tilde{\phi}_2 INC_{it} + \tilde{\phi}_3 X_{it} + \tilde{\omega}_{it} \quad (6)$$

where IC_{it} and INC_{it} represent the tests that measure cognitive and socioemotional skills, respectively. The use of these tests would generate endogeneity in the estimation of the model. Latent skills would be omitted, affecting both the propensity for engagement in a risk behavior and, in turn, the performance tests, and consequently the parameters estimated would be inconsistent and would not reflect the effect of skills on propensity to engage in a risk behavior.

In this regard, the application of two strategies is proposed: fixed effects and instrumental variables. In particular, in the fixed effects strategy the longitudinal data from the YLS are utilized to identify latent skills, which are not observed by the econometrician.

Panel data: fixed effects

The objective of this alternative is to make use of the longitudinal data from the standardized tests. The tests are determined by latent skills that are unobserved by the econometrician and are permanent in time. The fixed effects estimation of the panel data will help capture these latent skills.

Let:

$$IC_{it} = \delta_0 + \delta_1 X_{it} + \upsilon_{it} + C_i \quad (7)$$

$$INC_{it} = \gamma_0 + \gamma_1 X_{it} + u_{it} + NC_i \quad (8),$$

where IC_{it} and INC_{it} are the performance tests applied to the individual i at moment t; C_i and NC_i represent the latent (unobserved by the econometrician) cognitive and socioemotional skills of individual i; X are control variables; v_{it}, and u_{it} are terms of error. The identifying assumption is that all temporal correlations between two tests occur solely because of the latent skills (Cunha *et al.* 2010). Thus, the steps for the estimation are as follows:

1. First step: estimate a fixed effects model with panel data from Round 2 ($t = 2$) and Round 3 ($t = 3$). Once the model is estimated, $\widehat{IC}_{it}$ and $\widehat{INC}_{it}$ is predicted for $t = 2$ and $t = 3$.
2. Second step: recover the latent skills, finding the average value for the residues:

$$\widehat{C}_i = \frac{1}{2}[(IC_{i3} - \widehat{IC}_{i3}) + (IC_{i2} - \widehat{IC}_{i2})] \quad (9)$$

$$\widehat{NC}_i = \frac{1}{2}[(NIC_{i3} - \widehat{NIC}_{i3}) + (NIC_{i2} - \widehat{NIC}_{i2})] \quad (10)$$

However, these estimates are not consistent for $t = 2$ (since the average is only obtained based on two observations). Thus, fixed effects are calculated by groups to gain consistency (Bonhomme and Manresa 2014). The groups are assembled based on quantiles.[20]

Belonging to each of these groups is included in equations (1), (2) and (3). Thus, the effect of belonging to a group of latent skills (less able groups, more able groups) on the propensity to engage in a risk behavior is estimated.

20. Other discretizations were used (terciles, quartiles, deciles), but the one with the highest likelihood value was chosen.

Instrumental variables

This strategy is also based on the assumption that the only correlation between the skills tests is given by the latent skill that is constant over time (Cunha et al. 2010). The tests are expressed as follows:

$$IC_{i3} = \alpha_0 + \alpha_1 IC_{i2} + \delta X_{i3} + \varepsilon_{i3} \quad (11)$$

$$INC_{i3} = \gamma_0 + \gamma_1 INC_{i2} + \theta X_{i3} + \omega_{i3} \quad (12)$$

The parameters α_1 and γ_1 show the correlation between both measures at different moments in time. In this strategy, a two-stage estimation method is also employed, using two-stage least squares. In the first stage, both IC_{i2} and INC_{i2} will be used as instruments of IC_{i3} and INC_{i3}. These instruments conform to the following criteria:

i. Orthogonality criteria, assuming the absence of serial correlation between the errors, which is equivalent to saying that the only correlation between the skills tests is given by the latent skill that is constant over time and is present in both tests.
ii. Relevance criteria, which show the existence of a correlation between the instrument and the explanatory variable; that is, between the non-cognitive and socioemotional skills from rounds 3 and 2.

5. RESULTS

5.1 Longitudinal or data panel model: fixed effect methodology

Table 2 shows the results of the first estimation stage. In Regression I, it can be seen that the self-esteem index of an adolescent's main caregiver, the adolescent's age, and the area where he/she lives are statistically significant. In particular, the index of self-esteem of an adolescent's main caregiver and the adolescent's age positively influence self-esteem. Conversely, area of residence has a negative influence on the formation of self-esteem. On the other hand, Regression II shows that an adolescent's age is statistically significant and positive in explaining the development of self-efficacy.

Table 2
First stage in the fixed effects methodology: estimation of latent cognitive and non-cognitive skills

Variables	(1) Index of adolescent's self-esteem	(2) Index of adolescent's self-efficacy	(3) PPVT	(4) Mathematics test
- Adolescent's relationship with his or her parents	0.037	0.010	0.218**	0.084**
	(0.03)	(0.02)	(0.09)	(0.03)
- Index of self-esteem of the adolescent's main caregiver	0.126*	0.016	-	-
	(0.08)	(0.04)		
- Socioeconomic status perceived by the adolescent	- 0.182	0.092	-	-
	(0.18)	(0.10)		
- The adolescent is absent from school for more than a week due to ill health	0.806*	0.052	- 2.503	0.871
	(0.46)	(0.25)	(1.64)	(0.63)
- The adolescent lives in an urban area	- 2.542***	0.543	-	-
	(0.76)	(0.57)		
- Adolescent's age in months	0.115***	0.107***	0.520***	0.040
	(0.01)	(0.01)	(0.08)	(0.03)
- Adolescent's level of education	-	-	2.213**	2.146***
			(0.86)	(0,34)
- Constant	- 1.884	- 2.113*	- 18.035**	- 13.788***
	(1.91)	(1.14)	(7.21)	(2.93)
Number of observations	1,182	1,184	1,164	1,179
R-squared	0.536	0.693	0.815	0.761

Notes
* 10% Level of significance.
** 5% Level of significance.
*** 1% Level of significance.
Source: YLS (2006, 2009a); compiled by authors.

Regression III shows that an adolescent's relationship with his/her parents, age, and level of education to date has a positive and statistically significant influence on the development of a larger vocabulary. Likewise, Regression IV shows the strong influence of an adolescent's relationship with his or her parents and educational attainments to date on the development of mathematical and logical skills.

Table 3 shows the results of the second estimation stage. In accordance with the methodology described in the previous paragraph, cognitive and socioemotional skills are divided into quintiles. Quintile 1 represents adolescents with fewer latent cognitive and socioemotional skills, while Quintile 5 represents those with more skills of this type.

Table 3
Second stage in the fixed effects methodology: risk behavior, cognitive and non-cognitive skills

	Risk behaviors							
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
	Has consumed tobacco			Has consumed alcohol			Has had sexual relations	
Adolescent's latent non-cognitive skills								
Index of self-esteem (*raw score*)								
Quintile 2	0.077	0.079	0.071	0.017	0.019	-	-	-
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)			
Quintile 3	0.014	0.018	0.008	0.046	0.051	-	-	-
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)			
Quintile 4	- 0.000	0.003	- 0.008	0.001	0.008	-	-	-
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)			
Quintile 5	0.121**	0.122**	0.107**	0.034	0.036	-	-	-
	(0.06)	(0.06)	(0.05)	(0.06)	(0.06)			
Index of self-efficacy (*raw score*)								
Quintile 2	-0.050	- 0.052	-	- 0.096	- 0.097	- 0.090	- 0.033	- 0.052
	(0.06)	(0.06)		(0.06)	(0.06)	(0.06)	(0.05)	(0.05)
Quintile 3	-0.088	-0.091*	-	- 0.033	- 0.037	- 0.035	0.030	0.022
	(0.05)	(0.05)		(0.06)	(0.06)	(0.06)	(0.05)	(0.06)
Quintile 4	-0.016	- 0.019	-	- 0.069	- 0.074	- 0.069	0.037	0.016
	(0.06)	(0.06)		(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Quintile 5	-0.094*	-0.095*	-	- 0.139**	- 0.143**	- 0.136**	- 0.023	- 0.043
	(0.06)	(0.05)		(0.06)	(0.06)	(0.06)	(0.05)	(0.05)

	Risk behaviors							
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
	Has consumed tobacco			Has consumed alcohol			Has had sexual relations	
Adolescent's latent cognitive skills								
PPTV (*raw score*)								
Quintile 2	- 0.050	- 0.050	- 0.049	0.000	0.002	0.008	0.003	0.005
	(0.06)	(0.06)	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Quintile 3	- 0.045	- 0.047	- 0.051	- 0.120**	- 0.118*	- 0.114*	- 0.051	- 0.055
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Quintile 4	- 0.097*	- 0.100*	-0.106*	0.026	0.031	0.036	-0.091*	- 0.098*
	(0.06)	(0.06)	(0.05)	(0.06)	(0.06)	(0.06)	(0.05)	(0.05)
Quintile 5	- 0.073	- 0.083	- 0.086	0.071	0.075	0.078	-0.096*	- 0.097*
	(0.06)	(0.06)	(0.06)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)
Mathematics test (*raw score*)								
Quintile 2	0.009	-	-	0.036	-	-	-	-
	(0.05)			(0.06)				
Quintile 3	0.004	-	-	0.045	-	-	-	-
	(0.05)			(0.06)				
Quintile 4	- 0.020	-	-	- 0.006	-	-	-	-
	(0.05)			(0.06)				
Quintile 5	- 0.022	-	-	0.032	-	-	-	-
	(0.06)			(0.06)				

	Risk behaviors							
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
	Has consumed tobacco			Has consumed alcohol			Has had sexual relations	
The adolescent's friends consume tobacco	0,160***	0,160***	0,165***	-	-	-	0,086***	-
	(0,03)	(0,03)	(0,03)				(0,03)	
The adolescent's friends consume alcohol	-	-	-	0,435***	0,438***	0,439***	-	0,082**
				(0,03)	(0,03)	(0,03)		(0,03)
Adolescent's relationship with his/her parents	- 0,007**	- 0,007**	- 0,007**	- 0,003	- 0,003	- 0,003	- 0,006**	- 0,007**
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Gender (male)	0,151***	0,150***	0,157***	0,022	0,022	0,022	0,163***	0,165***
	(0,03)	(0,03)	(0,03)	(0,04)	(0,04)	(0,04)	(0,03)	(0,03)
Adolescent's age in months	0,008**	0,009**	0,010**	0,004	0,003	0,004	0,009**	0,009**
	(0,00)	(0,00)	(0,00)	(0,01)	(0,00)	(0,00)	(0,00)	(0,00)
Index of wealth (standardized score)	0,064	0,063	0,100	0,169	0,169	0,187	0,084	0,071
	(0,10)	(0,10)	(0,10)	(0,12)	(0,12)	(0,12)	(0,10)	(0,10)
Constant	- 1,279*	- 1,360*	- 1,679**	- 0,661	- 0,592	- 0,623	- 1,484*	- 1,413*
	(0,73)	(0,71)	(0,70)	(0,91)	(0,88)	(0,86)	(0,79)	(0,80)
Number of observations	528	528	528	531	531	531	532	532
R-squared	0,152	0,151	0,142	0,233	0,231	0,230	0,097	0,098
Adjusted R-squared	0,117	0,123	0,121	0,201	0,206	0,211	0,071	0,071

Notes

* 10% Level of significance.

** 5% Level of significance.

*** 1% Level of significance.

Source: YLS (2006, 2009a); compiled by authors.

Tobacco consumption

Estimations I, II and III of Table 3 correspond to the regression of tobacco use among adolescents. The socioemotional skills studied (self-esteem and self-efficacy) influence tobacco use by young people in different ways. Self-esteem is statistically significant and has a positive relationship with tobacco consumption in Quintile 5. That is, adolescents with higher self-esteem consume more cigarettes than those with lower self-esteem. The result appears to be counter-intuitive; however, as noted by Butler and Gazon (2005), and Estévez et al. (2006), it cannot be taken as given that adolescents with low self-esteem display externalizing problems, such as violent and delinquent behavior and drug use. Studies by Estévez et al. (2009), Musitu and Herrero (2003), and O'Moore and Kirkham (2001) show that high scores in certain areas of self-esteem (social and physical) may constitute a potential risk factor for the development of externalizing behavior problems. Moreover, the definition of tobacco use refers to the consumption of at least one cigarette per week. Self-efficacy, on the other hand, negatively and significantly influences tobacco use among adolescents. This result is compatible with youths in Quintiles 3 (Regression II) and 5 (Regression I and II). Greater control over one's life and emphasis on goal attainment reduces the likelihood of tobacco use. These adolescents may be conscious of the negative effects that such consumption could have on their future health.

With respect to latent cognitive skills, only the test that measures the level of receptive vocabulary proves to be statistically significant and negative, which correlates positively with the measurement of an individual's intelligence (Campbell *et al.* 2001; Gray et al. 1999; Campbell 1998). This suggests that more intelligent adolescents are less likely to consume tobacco. The above result is borne out in the three estimations proposed and is consistent with the result obtained by Cueto et al. (2011).

It should be stressed that peer pressure effects are positive and statistically significant for tobacco use by adolescents. Moreover, the relationship that a young person has with his/her parents is statistically significant and negative, so it is concluded that dialogue and a good parent-child relationship could have an influence on the decision not to consume that substance. Finally, male adolescents are more inclined to use tobacco than their female counterparts, and consumption thereof increases with age in both gender groups.

Alcohol consumption

Estimations IV, V and VI in Table 2 correspond to alcohol use among adolescents. As regards latent socioemotional skills, an adolescent's self-efficacy is found to be statistically significant. The relationship between self-efficacy and alcohol consumption is negative and so it is concluded that a youth with better control over his or her life and a long-term outlook will opt not to drink alcohol. Innate cognitive skills, especially those measured using the receptive vocabulary test, have a negative and statistically significant relationship with alcohol consumption. That is, the higher an adolescent's level of intelligence, the more likely that he or she will opt not to drink alcohol.

One relevant aspect is the effect that peer pressure from a young person's social circle can exert on the adoption or otherwise of a risk behavior. In this particular case, it is observed that if an adolescent's friends drink alcohol, that adolescent will be more likely to adopt this risk behavior. It should be noted that all the aforementioned results with alcohol consumption as a dependent variable are the same as those for models IV to VI, and as such are concluded to be robust.

Sexual initiation

Finally, models VII and VIII in Table 3 provide the results of regressions related to adolescents' sexual initiation. In this particular case, it was found that a youth's level of intelligence; that is, his/her innate cognitive skills, is statistically significant and has a negative relationship with early sexual initiation. This behavior is observed in regressions VII and VII. Moreover, the peer effect has a positive and statistically significant influence on early sexual initiation among adolescents. In addition, when an adolescent's friends consume both alcohol and tobacco, these practices have a direct effect on early sexual initiation. As to the influence that an adolescent's relationship with his/her parents has on sexual initiation, a negative and statistically significant relationship is found; thus, if there is a high level of dialog and understanding between an adolescent and his/her parents, this will impact the adolescent's final decision on whether or not to engage in this behavior. Moreover, the age of an adolescent has a positive and statistically significant influence on sexual initiation, while males are more likely to start their sex life earlier than females.

In conclusion, skills reduce the propensity to engage in a risk behavior, and do so by around 10 percentage points. A second result is that socioemotional skills have a greater effect in this regard than do cognitive skills.

5.2 Instrumental variables[21]

Two models were estimated. In the first, the endogenous variable is the measurement of innate cognitive skills by the receptive vocabulary test. In the second, the endogenous variable is the mathematics test.[22]

Tables 4 and 5 show the first stage of model estimation, and instrumentalize the mathematics and receptive vocabulary tests, respectively, taken by adolescents in 2009 (Round 3). For the three behavior types, and by instrumentalizing the mathematics test, we find that variables such as the vocabulary and mathematics tests in Round 2, as well as the reading comprehension test in Round 3, are good instruments (Table 4). This is deduced by observing the high R-squared values[23] of the models that incorporate these instruments, specifically: 42.8%, 44.5%, and 44.2% for tobacco use, alcohol use, and early sexual initiation, respectively. Moreover, it can be seen that the three abovementioned instruments are significant.[24] On the other hand, by instrumentalizing the vocabulary test in Round 3 (Table 5) and using the same instruments as in the mathematics test - except for sexual relations, where the indices of non-cognitive skills are incorporated - similar results are obtained. The R-squared for tobacco use, alcohol use, and early sexual initiation are 63.3%, 56.8% and 63.9%, respectively, while the significance varies by behavior type, but the vocabulary test from Round 2 is a significant variable in all three models.

21. This methodology was employed only to obtain the relationship between cognitive skills and the three risk behaviors studied, as no effective instrument was found within the study to explain their relationship with non-cognitive skills.
22. These measurements were used separately because both tests that measure an adolescent's cognitive skills are highly correlated, which causes a loss of significance at the time of estimation.
23. R-squared as a goodness-of-fit measurement permits the determination that the instruments selected significantly explain the cognitive skills from Round 3 (PPVT and mathematics) and that this explanation is not correlated with the error. In this way, the fulfillment of the two criteria necessary for a good instrument is verified.
24. The significance shows that the instruments are important in explaining the instrumentalized variable: in this case, the mathematics test in Round 3.

Table 4
First stage in the methodology of instrumental variables: instrumentalizing the mathematics test in Round 3

	Two stage least squares (2sls)		
Instrumentalized variable	Has consumed tobacco Mathematics test	Has consumed alcohol Mathematics test	Has had sexual relations Mathematics test
PPVT (*raw score*) (Round 2)	0,059***	0.020***	0.056***
	(0.016)	(0.016)	(0.015)
Mathematics test (raw score) (Round 2)	0.975***	1.009***	0.982***
	(0.155)	(0.151)	(0.147)
Cloze test for reading comprehension *(raw score)*	0.263***	0,270***	0.267***
(Round 2)	(0.051)	(0.051)	(0.049)
Adolescent's non-cognitive skills: index of	- 0.009	- 0.006	-
self-esteem	(0.055)	(0.054)	
Adolescent's non-cognitive skills: index of	0.089	0,054	-
self-efficacy	(0.127)	(0.130)	
The adolescent's friends consume tobacco	0.203	-	-
	(0.341)		
The adolescent's friends consume alcohol	-	0.138	-
		(0.371)	
The adolescent's friends have had sexual relations	-	-	0.014
at an early age			(0.014)
Adolescent's relationship with his or her parents	0.051*	0.043	0.049*
	(0.027)	(0.027)	(0.026)
Gender (male)	0.105	0.052	0.169
	(0.339)	(0.341)	(0.335)
Adolescent's age in months	- 0.020	- 0.014	- 0.026
	(0.039)	(0.039)	(0.039)
Index of wealth (*standardized score*)	0.014	- 0.262	- 0.059
	(1.169)	(1.155)	(1.148)
Adolescent's level of education	0.454**	0.480**	0.518***
	(0.202)	(0.206)	(0.199)
Constant	- 3.023	- 3.489	- 0.946
	(6.934)	(6.905)	(6.628)
Number of observations	555	560	571
R-squared	0.439	0.456	0.451
Adjusted R-squared	0.428	0.445	0.442

Notes
* 10% Level of significance.
** 5% Level of significance.
*** 1% Level of significance.
Source: YLS (2006, 2009a); compiled by authors.

Table 5
First stage in the methodology of instrumental variables: instrumentalizing the PPVT test in Round 3

Instrumentalized variable	2 sls		
	Has consumed tobacco PPVT	Has consumed alcohol PPVT	Has had sexual relations PPVT
P PPVT (*raw score*) (Round 2)	0.437***	0.568***	0.437***
	(0.041)	(0.043)	(0.041)
Mathematics test (*raw score*) (Round 2)	0.380	1.431***	0.445
	(0.368)	(0.389)	(0.349)
Cloze test for reading comprehension (*raw score*)	1.097***	-	1.085***
(Round 2)	(0.129)		(0.126)
Adolescent's non-cognitive skills: index of self-esteem	-	-	- 0.102
			(0.147)
Adolescent's non-cognitive skills: index of self-efficacy	-	-	0.153
			(0.277)
The adolescent's friends consume tobacco	- 1.519*	-	-
	(0.856)		
The adolescent's friends consume alcohol	-	0.371	-
		(0.987)	
The adolescent's friends have had sexual relations at	-	-	0.060**
an early age			(0.031)
Adolescent's relationship with his or her parents	(0.023)	0.149*	0.045
	0.070	(0.077)	(0.067)
Gender (male)	1.947**	1.312	2.143**
	(0.830)	(0.894)	(0.835)
Adolescent's age in months	- 0.030	- 0.071	- 0.031
	(0.106)	(0.109)	(0.105)
Index of wealth (*standardized score*)	6.189**	7.972**	5.705*
	(3.062)	(3.216)	(3.074)
Adolescent's level of education	1.629***	2.426***	1.541***
	(0.478)	(0.521)	(0.477)
Constant	33.482*	30.664	32.269*
	(18.262)	(18.899)	(19.236)
Number of observations	544	549	557
R-squared	0.639	0.574	0.646
Adjusted R-squared	0.633	0.568	0.639

Notes
* 10% Level of significance.
** 5% Level of significance.
*** 1% Level of significance.
Source: YLS (2006, 2009a); compiled by authors.

Table 6 presents the results from the second stage for both models[25] according to each of the risk behaviors studied. In the case of tobacco consumption and early sexual initiation, the results show that latent cognitive skills result in an adolescent being less inclined to engage in these risk behaviors. The effect is a reduction of 1 to 2 percentage points in the likelihood of adoption. This relationship can be seen in both the model that uses innate cognitive skills as an explanatory variable measured through the mathematics test, and in the model where innate cognitive skills are measured by the PPVT. Moreover, for both types of behavior the relationship with parents is also a component that affects the likelihood of an adolescent to smoke or to have sexual relations at an early age. It can also be seen that the social factor also exerts an influence since if an adolescent's best friends smoke or have sexual relations, that adolescent is more susceptible to engaging in the same behavior. This is most pronounced in the case of tobacco use. The two factors - relationship with parents and practices of peers - are linked to the literature discussed in the first section, and with the descriptive statistics carried out.

On the other hand, for the case of alcohol consumption, the results indicate a different trend, as adolescents with more latent cognitive skills are more likely to consume alcohol. One explanation for this behavior has to do with the fact that alcohol consumption is a social behavior; as an adolescent widens his or her circle of friends, that is, engages in a more active social life and meets people not only at his or her school but, for instance, at an academy or in an extra-curricular group, he/she will be more exposed to consumption of this substance. This, in turn, is more clearly reflected in the results obtained in the regression, as the variable that indicates whether an adolescent's friends drink alcohol has a positive and significant effect on that adolescent also doing so.

25. One including only innate vocabulary skills (columns 1, 3, and 6) and another including only mathematical skills (columns II, IV, and V).

Table 6
Second stage in the instrumental variables methodology: risk behavior and cognitive skills

Instrumentalized variable	2sls					
	(I)	(II)	(III)	(IV)	(V)	(VI)
	Has consumed tobacco		Has consumed alcohol		Has had sexual relations	
Adolescent's latent cognitive skills	- 0.003*	-	0.004*	-	-	- 0.005**
PPVT (raw score)	(0.00)		(0.00)			(0.00)
Mathematics test (raw score)	-	- 0.014**	-	0.014*	- 0.017**	-
		(0.01)		(0.01)	(0.01)	
The adolescent's friends consume tobacco	0.184***	0.187***	-	-	-	-
		(0.03)	(0.03)			
The adolescent's friends consume alcohol	-	-	0.419***	0.414***	-	-
			(0.03)	(0.03)		
The adolescent's friends have had sexual relations at an early age	-	-	-	-	0.005***	0.005***
					(0.00)	(0.00)
Adolescent's relationship with his or her parents	- 0.006**	- 0.005*	- 0.004	- 0.004	- 0.004	- 0.004*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Gender (male)	0.175***	0.167***	0.028	0.030	0.156***	0.171***
	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)	(0.03)
Adolescent's age in months	0.011***	0.011***	0.006	0.007	0.013***	0.014***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Index of wealth (standardized score)	0.172	0.141	0.108	0.114	0.266***	0.293***
	(0.11)	(0.10)	(0.13)	(0.12)	(0.10)	(0.10)
Adolescent's level of education	- 0.002	0.000	- 0.024	- 0.022	- 0.050**	- 0.054**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	- 1.604**	- 1.818***	- 1.244	- 1.164	- 1.657**	- 1.551**
	(0.66)	(0.64)	(0.78)	(0.77)	(0.73)	(0.76)
Number of observations	544	555	549	560	571	557
R-squared	0.142	0.118	0.188	0.197	0.112	0.136

Notes
* 10% Level of significance.
** 5% Level of significance.
*** 1% Level of significance.
Source: YLS (2006, 2009a); compiled by authors.

6. CONCLUSION AND RECOMMENDATIONS

The estimation strategy employed in the previous section allows the following conclusions to be drawn. The results show that cognitive and socioemotional skills reduce the likelihood that an adolescent will adopt a risk behavior of one kind or another by an average of ten percentage points. These skills also negatively influence tobacco use and early sexual initiation. The relationship is the reverse for alcohol use; this is explained by the high social component of these behaviors. Finally, the effect that socioemotional skills have on reducing risk behaviors is slightly greater than is the case for cognitive skills.

Currently, Peru has not yet implemented any social policies aimed at the development of young people's cognitive and socioemotional skills. Given the influence that these skills have on an adolescent's final decision to engage in a risk behavior such as tobacco or alcohol use or early sexual initiation, the recommended political strategy is to implement social programs that seek to promote the development of cognitive and socioemotional skills based on a comprehensive evaluation of individuals; that is, both a psychological and intelligence test through which each adolescent's weak points, which might prompt him or her to engage in a risk behavior, can be evaluated. This assessment should be carried out periodically, starting from the early years of an individual's life cycle (Dercon and Sánchez 2011; Yamada et al. 2013).

Though this study has succeeded in responding to the questions posed, some uncertainties remain. For example, in what way do cognitive and socioemotional skills influence the adoption of one or more risk behaviors by an adolescent? That is, does an adolescent with more skills tend to adopt just one risk behavior? Or would he or she be more inclined to adopt two or more types or risk behavior simultaneously?

BIBLIOGRAPHY

ANTEGHINI, Marcia; Helena FONSECA; Marjorie IRELAND and Robert BLUM
2001 "Health Risk Behaviors and Associated Risk and Protective Factors among Brazilian Adolescents in Santos, Brazil." In: *Journal of Adolescent Health,* vol. 28, N° 4, pp. 295-302.

ASHRAF, Nava; Colin F. CAMERER and George LOEWENSTEIN
2005 "Adam Smith, Behavioral Economist." In: *Journal of Economic Perspectives,* vol. 19, N° 3, pp. 1-15.

BANCO INTERAMERICANO DE DESARROLLO
2013 *Guía para medir comportamientos de riesgo en jóvenes.* Washington DC: BID.

BECKER, Gary S. and Kevin M. MURPHY
1988 "A Theory of Rational Addiction." In: *Journal of Political Economy,* vol. 96, N° 4, pp. 675-700.

BLUM, Robert; Trisha BEUHRING; Marcia L. SHEW; Linda H. BEARINGER; Renée E. SIEVING and Michael D. RESNICK
2000 "The Effects of Race/Ethnicity, Income, and Family Structure on Adolescent Risk Behaviors." In: *American Journal of Public Health,* vol. 90, N° 12, pp. 1879-1884.

BONHOMME, Stéphane and Elena MANRESA
2014 *Grouped Patterns of Heterogeneity in Panel Data.* Madrid n.p.

BOYDEN, Jo
2008 *Children's Social Cognition and Development in the Context of Adversity in Ethiopia.* n.p.: Young Lives.

BUTLER, Richard and Sarah L. GAZON
2005 *Self Esteem/Self Concept Scales for Children and Adolescents: A Review.* In: *Child and Adolescent Mental Health,* vol. 10, pp. 190-201.

CAMPBELL, Jonathan M.
1998 "Review of the Peabody Picture Vocabulary Test," 3rd ed. In: *Journal of Psychoeducational Assessment,* N° 16-4, pp. 334-338.

CAMPBELL, Jonathan M..; Stephen K. BELL and Lori K. KEITH
2001 "Concurrent Validity of the Peabody Picture Vocabulary Test-Third Edition as an Intelligence and Achievement Screener for Low SES African American Children." In: *Assessment,* vol 8, N° 1, pp. 85-94.

CENTRO DE PROMOCIÓN Y DEFENSA DE LOS DERECHOS SEXUALES Y REPRODUCTIVOS
2011 *Adolescencia y acceso a salud reproductiva y educación sexual. ¿Qué puedo cambiar?* Lima: Promsex.

COMISIÓN NACIONAL PARA EL DESARROLLO Y VIDA SIN DROGAS Y OBSERVATORIO PERUANO DE DROGAS
2010 *Estudio del impacto social y económico del consumo de drogas en el Perú.* Lima: Devida/OPD.

COTTRELL, Lesley; Yu SHULI; Hongjie LIU; Lynette DEVEAUX; Sonja LUNN; Rosa Mae BAIN and Bonita STANTON
2007 "Gender Based Model Comparisons of Maternal Values, Monitoring, Communication, and Early Adolescents Risk Behavior." In: *Journal of Adolescent Health,* vol. 41, N° 4, pp. 371-379.

CRONBACH, Lee J.
1951 "Coefficient Alpha and the Internal Structure of Tests." In: *Psychometrika,* vol. 16, N° 3, pp. 297-334.

CUETO, Santiago and Juan LEÓN
2012 *Psychometric Characteristics of Cognitive Development and Achievement Instruments in Round 3 of Young Lives.* Oxford: Young Lives.

CUETO, Santiago; Víctor SALDARRIAGA and Ismael G. MUÑOZ
2011 "Conductas de riesgo entre adolescentes peruanos: un enfoque longitudinal." In: GRADE. *Salud, interculturalidad y comportamientos de riesgo.* Lima: GRADE.

CUNHA, Flavio; James HECKMAN and Susanne SCHENNACH
2010 "Estimating the Technology of Cognitive and Noncognitive Skill Formation." In: *Econometría,* vol. 78, N° 3, pp. 883-931.

DERCON, Stefan and Alan SÁNCHEZ
2011 *Long-Term Implications of Under-Nutrition on Psychosocial Competencies: Evidence from Four Developing Countries.* Oxford: Young Lives.
2008 *Poverty, Malnutrition and. its Psycho-social Impact on Children.* Oxford: Young Lives.

DEVELLIS, R. F.
2003 *Scale Development: Theory and Applications,* 2nd ed., vol 26. Thousand Oaks, CA: Sage.

ESTEVEZ, Estefanía; Belén MARTÍNEZ and Gonzalo MUSITU
2006 "La autoestima en adolescentes agresores y víctimas en la escuela: la perspectiva multidimensional." In: *Intervención Psicosocial,* vol. 15, N° 2, pp. 223-232.

ESTEVEZ, Estefanía; Sergio MURGUI and Gonzalo MUSITU
2009 "Psychosocial Adjustment in Bullies and Victims of School Violence." In: *European Journal of Psychology of Education,* vol. 24, N° 4, pp. 473-483.

FONDO DE POBLACIÓN DE LAS NACIONES UNIDAS
2003 *El Estado de la población mundial 2003.* New York: UNFPA.

GRANTHAM-MACGREGOR, Sally; Yin Bum CHEUNG; Santiago CUETO; Paul GLEWWE; Linda RICHTER and Barbara STRUPP
2007 "Developmental Potential in the First 5 Years for Children in Developing Countries." In: *Lancet*, N° 369, pp. 60-70.

GRAY, Shelley; Elena PLANTE; Rebecca VANCE and Mary HENRICHSEN
1999 "The Diagnostic Accuracy of Four Vocabulary Tests Administered to Preschool-Age Children." In: *Language, Speech, and Hearing Services in Schools,* N° 30, pp. 196-206.

HECKMAN, James and Flavio CUNHA
2007 "The Technology of Skill Formation." In: *American Economic Review,* vol. 97, N° 2, pp. 31-47.

HECKMAN, James and Tim KAUTZ
2012 *Hard Evidence on Soft Skills.* Chicago: Labour Economics.

INEI, INSTITUTO NACIONAL DE ESTADÍSTICA E INFORMÁTICA
2012 *Endes. Encuesta Demográfica y de Salud Familiar.* Lima: INEI.

JESSOR, Richard
1991 "Risk Behavior in Adolescence: A Psychosocial Framework for Understanding and Action." In: *Journal of Adolescent Health,* vol. 12, N° 8, pp. 597-605.

LIKERT, Rensis
1932 "A Technique for the Measurement of Attitudes." In: *Archives of Psychology,* vol. 22, N° 140, pp. 1-55.

MUSITU, Gonzalo and Juan HERRERO
2003 "El rol de la autoestima en el consumo moderado de drogas en la adolescencia." In: *Sociotam. Revista Internacional de Ciencias Sociales,* N° 13, pp. 285-306.

NUNNALLY, Jum and Ira BERNSTEIN
1994 *Psychometric Theory.* 3rd ed. New York: McGraw-Hill.

O'DONOGUE, Ted and Matthew RABIN
2000 "Risky Behavior among Youths: Some Issues from Behavioral Economics." In: GRUBER, J. (ed.). *Risky Behavior among Youths: An Economic Analysis.* Chicago: University of Chicago Press, pp. 29-68.

O'MOORE, Mona and Catherine KIRKHAM
2001 "Self-esteem and its Relationship to Bullying Behavior." In: *Aggressive Behavior,* N° 27, pp. 269-283.

OMS, ORGANIZACIÓN MUNDIAL DE LA SALUD
1998 *Promoción de la salud.* Geneva OMS.

OPD, OBSERVATORIO PERUANO DE DROGAS
2009 *III estudio nacional: prevención y consumo de drogas en estudiantes de secundaria. 2009.* Lima: OPD.

STROUP-BENHAM, Christine; Fernando M. TREVIÑO and Dorothy B. TREVIÑO
1990 "Alcohol Consumption Patterns among Mexican-American Mothers and among Children from Single and Dual-Headed Households: Findings from HHANES, 1982-84." In: *American Journal of Public Health,* vol. 80, pp. 36-41.

THE NATIONAL BUREAU OF ECONOMIC RESEARCH
2001 *Risky Behavior among Youths: An Economic Analysis* (J. Gruber, ed.). Chicago: University of Chicago Press.

UNICEF, FONDO DE LAS NACIONES UNIDAS PARA LA INFANCIA
2011 *Estado mundial de la infancia.* New York: UNICEF.

VERNER, Dorte and Ana RUTE CARDOSO
2007 *Youth Risk-Taking Behavior in Brazil: Drug Use and Teenage Pregnancy.* Washington DC: World Bank.

VINCENT, Guilamo-Ramos; James JACCARD; Robert TURRISI and Margaret JOHANSSON
2005 "Parental and School Correlates of Binge Drinking among Middle School Students." In: *American Journal of Public Health,* vol. 95, N° 5, pp. 894-899.

WANG, Ruey-Hsia; Hsiu-Yueh HSU; Shu-Yuan LIN; Chung-Ping CHENG and Shu-Li LEE
2009 "Risk Behaviours among Early Adolescents: Risk and Protective Factors." In: *Journal of Advanced Nursing,* vol. 66, N° 2, pp. 313-323.

WEILAND, Barbara; Steven KORYCINSKI; Mary SOULES; Jon-Kar ZUBIETA; Robert ZUCKER and Mary HEITZEG
2014 "Substance Abuse Risk in Emerging Adults Associated with Smaller Frontal Gray Matter Volumes and Higher Externalizing Behaviors." In: *Drug and Alcohol Dependence,* vol. 137, pp. 68-75.

YAMADA, Gustavo; Pablo LAVADO and Luciana VELARDE
2013 *Habilidades no cognitivas y brecha de género salarial en el Perú.* Lima: BCRP.

YOUNG LIVES STUDY
2011a *Justification of The Self-Administered Questionnaire, 15 Year Old Cohort.* Oxford: Young Lives.
2011b *Justification of the Content of The Household Questionnaires: Round 3.* Oxford: Young Lives.
2009a Young Lives, Round 3, database. <http://www.ninosdelmilenio.org>.
2009b "Justification of the Content of the 8-Year-old Pilot Child Questionnaire." UK Data Archive Study N° 6853. <http://doc.ukdataservice.ac.uk/doc/6853/mrdoc/pdf/6853quest_justification_r3.pdf>.
2006 Young Lives, Round 2, database. <http://www.ninosdelmilenio.org

ANNEXES

Annex 1
Endogenous variables, relevant exogenous variables, and control variables according to values or indices used in the study

Table 1A
Endogenous variables

Name	Type of variable	Description
tabaco	Discrete	Takes two values: (i) 1, if the adolescent uses tobacco; (ii) 0, otherwise.
alcohol	Discrete	Takes two values: (i) 1, if the adolescent uses alcohol; (ii) 0, otherwise.
relsex	Discrete	Takes two values: (i) 1, if the adolescent has had sexual relations at an early age; (ii) 0, otherwise.

Table 1B
Relevant exogenous variables

Name	Type of variable	Description
iautoestima	Continuous	Index that equals the sum of the percentage obtained in questions on pride and shame applied to the adolescent.
iautoeficacia	Continuous	Index that equals the sum of the percentage obtained in questions on the adolescent's decision-making on his/her future applied to the adolescent.
PPVT	Continuous	Percentage obtained in the PPVT applied to the adolescent.
Math	Continuous	Percentage obtained in the mathematics test applied to the adolescent.
Cloze	Continuous	Percentage obtained in the reading comprehension test applied to the adolescent.

Table 1C
Explanatory control variables

Name	Type of variable	Description
relationparents[1]	Continuous	Index that equals the sum of the percentage obtained in questions on the relationship between the adolescent and his/her parents, applied to the adolescent.
iautoestimacare[2]	Continuous	Index that equals the sum of the percentage obtained in questions on pride and shame, applied to the adolescent's primary caregiver.
iautoeficaciacare[3]	Continuous	Index that equals the sum of the percentage obtained in questions on the decision-making of the adolescent's primary caregiver about his/her future, applied to the adolescent's primary caregiver.
sestatus	Discrete	Socioeconomic status perceived by the adolescent. Assigned the following values: (i) 1, very wealthy; (ii) 2, wealthy; (iii) 3, comfortable (able to survive); (iv) 4, never had enough (difficult to survive); (v) 5, poor; (vi) 6, destitute.
educgrade	Discrete	Level of education attained by the adolescent. Assigned the following values: (i) 0, has not finished first grade; (ii) k, p for all k = 1, 2, ..., 11, if the adolescent is currently in grade k.
mschool	Discrete	Assigned two values: (i) 1, if the adolescent was absent from school for more than one week due to illness; (ii) 0, otherwise.
friendsmoke	Discrete	Assigned two values: (i) 1, if the adolescent's friends use tobacco; (ii) 0, otherwise.
friendsdrink	Discrete	Assigned two values: (i) 1, if the adolescent's friends use alcohol; (ii) 0, otherwise.
friendsex	Discrete	Assigned two values: (i) 1, if the adolescent's friends have had sexual relations at an early age; (ii) 0, otherwise.
typesite	Discrete	Assigned two values: (i) 1, if the adolescent lives in an urban area; (ii) 0, otherwise.
gender	Discrete	Assigned two values: (i) 1, if the adolescent's gender is male; (ii) 0, otherwise.
agechild	Continual	Adolescent's age at present (depending on whether in round 2 or 3).
wi	Continual	Wealth index, comprised of the sum of the following indicators; quality of home infrastructure; consumption of durable goods (appliances) and access to basic utilities in the home.

Notes
(1) To construct the index that measures the adolescent's relationship with his/her parents, the following statements were used: "Do you feel comfortable expressing your opinions and feelings to your parents or guardians?"; "Most of the time, your parents or guardians treat you fairly when you do something wrong;" "In comparison with your sibling(s), you are given less things"; and "in comparison with your sibling(s), you have less freedom to go out when you please".
(2) To construct the index that measures the self-esteem of the adolescent's primary caregiver, the following statements were used: "If I make an effort, I can improve my situation in life"; "I like to plan for my future"; "I (do not) have the possibility of choosing what school to enroll my child(ren) in"; "If my child(ren) gets sick, there is little I can do to help him/her get better"; and "I cannot help my child(ren) perform well at school however much I try."
(3) To construct the index that measures the self-efficacy of the adolescent's primary caregiver, the following statements were used: "I am proud to show my friends where I live"; "I am proud (ashamed) of my clothes"; "I am proud of the work that the household head does"; "I am proud of the work I do"; and "I am proud of my children."

Annex 2
Construction of indicators of legal drug use and sexual relations

To construct the indicators of tobacco and drug use, the following questions were employed in the confidential questionnaire:

- How often do you smoke cigarettes these days?
- How often do you normally drink alcohol?

The indicators of alcohol and tobacco were assigned the value of 1 if the adolescent responded that he/she consumes alcohol every day, at least once per week or month, only on special occasions, or very rarely. Otherwise, if the adolescent responds that he/she has never used alcohol or tobacco, the indicator will take the value of 0.
The indicator that shows whether adolescents have had sexual relations is constructed on the basis of the following statement:

- I have never had sex.

The indicator was assigned the value of 1 if the adolescent responds negatively to the above statement, and the value of 0 if the adolescent responds affirmatively to the statement.

Annex 3
Statements employed to construct the indices of self-esteem and self-efficacy

Table 3A
Index of self-esteem

Positive (+) or Negative (-)	Statements by roud
Statements from Round 3 of the YLS	
+	"I am proud of my shoes or of having shoes."
+	"I am proud of my clothes."
+	"I am never ashamed because I don't have the materials I need for school."
+	"I am proud of having the proper uniform."
+	"I am proud of the work I have to do."
Statements from Round 2 of the YLS	
+	"I am proud to show my friends where I live."
+	"I am proud of the work the household head does."
+	"I am proud of my achievements at school."
+	"I am proud of the work I have to do."
-	"I am ashamed of my clothes."
-	"I am ashamed of my shoes."
-	"At times I feel ashamed because I do not have the materials I need for school."
-	"I am ashamed not to have the proper uniform."
-	"I am ashamed of the work I have to do."

Table 3B
Index of self-efficacy

Positive (+) or Negative (-)	Statements by round
Statements from Round 3 of the YLS	
+	"If I make an effort, I can improve my situation in life."
+	"I like to make plans for my education and future work."
+	"If I study hard at school, I will be rewarded with better work in the future."
+	"I can choose what job to do."
-	"Other people in my family make decisions on how I spend my time."
Statements from Round 2 of the YLS	
+	"If I make an effort, I can improve my situation in life."
+	"I like to make plans concerning my education and future work."
+	"If I study hard at school, I will be rewarded with better work in the future."
+	"I have no choice in what job I do."
-	"Other people in my family make decisions on how I spend my time."