UNIVERSIDAD PERUANA DE CIENCIAS APLICADAS
FACULTAD DE CIENCIAS DE LA SALUD
PROGRAMA ACADÉMICO DE MEDICINA HUMANA

**Associated factors to develop traumatic events in the
future: *Young Lives* analysis.**

TESIS

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AUTOR

Rafael Quiroz Portella (0000-0003-2619-2306)

ASESOR DE TESIS

Germán Felipe Alvarado Cutipa Flores (0000-0003-4531-7717)

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Abstract

Introduction: Until now most of the research involving intelligence and associated factors to suffer traumatic events (TE) comes from research done in adults or in children from developed countries, from refugee camps or survivors of a war, terrorism or natural disasters. Much less information is available on longitudinal studies with community-based samples of children from low and middle income countries out of these specific events.

Objective: To determine the association between intelligence and other factors to suffer TE in *Young Lives* (YL) children of two low-middle income countries: India and Peru.

Methods: We did a secondary analysis of *Young Lives cohort Study* which included 1669 children around 8 years old of age from India and Peru. YL uses a clustered-stratified, multi-stage, random sampling per country. Upon recruitment, children's intelligence was assessed applying the *Raven's Colored Progressive Matrices Test* and the child's caregivers were asked about socio-demographic factors. On follow up, 4 years later the caregivers were asked about the occurrence of TE in their child. Robust Poisson Regression was used for the multivariate analysis.

Results: Around 20% of children in the study had suffered TE. Intelligence was not related to suffer future TE. Living on rural areas have 49% more risk of suffering a TE compared to urban locations. Children with history of past TE had 40% more risk of suffering another TE during follow-up. Finally, no association was found between TE and other socio-demographic variables.

Conclusions: Intelligence was not an associated factor for future TE on YL children from India and Peru. But living on rural locations and having the history of TE were both risk factors.

MeSH key words: Child Psychology, Intelligence, Wounds and Injuries, Accidents.

Resumen

Introducción: Al momento, la mayoría de información sobre inteligencia y otros factores asociados a sufrir eventos traumáticos (ET) proviene de estudios realizados en adultos o en niños provenientes de países desarrollados, campos de refugiados o sobrevivientes de guerras, terrorismo o desastres naturales. Fuera de estas circunstancias especiales, poca información se tiene sobre el desarrollo de ET en niños provenientes de estudios longitudinales en muestras comunitarias de países de bajo y medianos ingresos económicos.

Objetivo: Determinar la asociación entre inteligencia y otros factores asociados para sufrir ET en los niños del estudio *Niños del Milenio* (NM) de 2 países de bajo y mediano ingreso económico: India y Perú.

Métodos: Se realizó un análisis de datos secundarios del estudio longitudinal de NM que incluyó 1669 niños de alrededor de 8 años de edad de estos 2 países. Al inicio del estudio, la inteligencia fue evaluada usando el *Test de Matrices Progresivas Coloreadas de Raven* y se les preguntó a los cuidadores sobre otras variables sociodemográficas. En el seguimiento, 4 años más tarde se les preguntó a los cuidadores si ocurrió un ET en sus niños. Se empleó la regresión de Poisson con varianza robusta para el análisis multivariado.

Resultados: El 20% de los niños sufrieron ET. La inteligencia no fue un factor asociado para sufrir ET. Vivir en zonas rurales resulta en un 49% más riesgo de sufrir ET que vivir en zonas urbanas. Niños con el antecedente de un ET antes del estudio tienen un 40% más riesgo de sufrir un segundo ET que niños sin ese antecedente.

Conclusiones: Inteligencia no fue un factor asociado a sufrir ET en los niños de NM de India y Perú. Sin embargo, vivir en lugares rurales y tener el antecedente de sufrir ET fueron factores de riesgo.

Palabras clave: Psicología Infantil, Inteligencia, Heridas e Injurias, Accidentes

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Introduction

The concept of traumatic events (TE) involves incidents resulting on any physical, emotional or psychological distress to the individual. They may also represent a serious injury or potential death and can possibly pose a threat to personal safety or a person's environment ⁽¹⁾. Previous researchers have found that the prevalence of TE in adolescence and young adults may be as high as 82% ⁽²⁾ and that TE do not occur at random ⁽³⁾; instead, there are factors that increase the chance of suffering a TE ⁽³⁾. For example, some studies suggested that males have more probability to suffer TE than females ⁽²⁻⁴⁾. Others, have found that people who live in urban areas are also more exposed to TE than the ones who reside in suburban ones ⁽³⁾.

Traumatic experiences can occur at any time including very early in life ⁽⁴⁾. In fact, one study pointed out that at the age of 16 years old 68% of children and adolescents had already suffered at least one TE ⁽⁵⁾. Another concluded that children with comorbid psychopathologies like antisocial conduct or hyperactivity disorders were at risk of experiencing TE ⁽⁶⁾. A more recent study showed similar results: children with conduct disorders were 2.7 times more likely to experience a TE ⁽⁷⁾. The same was demonstrated in people with psychopathologies like anxiety and depression ⁽³⁾. Finally, environmental risk factors such as dysfunctional household or families play a role on developing TE ⁽⁶⁾.

TE in a varying degree have an impact on the child's life, although, most of them recover to normal functioning ⁽⁸⁾. After a child is exposed to a TE short term consequences are in a great manner universal ⁽⁸⁾ and these include: new fears, separation anxiety, sleep disturbances,

anhedonia, deficit in concentration, anger management problems, irritability ⁽⁸⁾, worry about death or personal safety, attention difficulties, somatic complaints ⁽⁹⁾, learned helplessness ⁽¹⁰⁾, and post-traumatic stress disorder (PTSD).

Furthermore, children also exhibit long term consequences of TE when adults. Childhood trauma exposure can increase the risk of medical conditions like: asthma, cardiovascular disease, stroke, diabetes mellitus ⁽⁹⁾, metabolic syndrome, hypercholesterolemia, glucose intolerance, hypertension and obesity ⁽¹⁰⁾. Moreover, psychological conditions are also reported consequences and include: attention deficit and hyperactivity disorder, depression, anxiety, personality disorders, substance abuse, mood disorders, eating disorders, attachment disorders, conduct disorders, personality disorders ⁽¹⁰⁾ and PTSD.

As exposed, TE results on a wide range of consequences. Previous research concludes that when children experience a TE only a small proportion developed PTSD ^(3,4). Taking the previous findings into consideration, TE are more prevalent than PTSD ⁽²⁻⁵⁾. The relationship between TE and PTSD is a complex rather than a simple correlation. In this sense, some children after exposure to a TE may developed PTSD while others will not. This is partially explained by resilience which is “the ability of a child to recover and show early and effective adaptation following a potentially traumatic event” ⁽¹¹⁾. Resilience is shown in most of the children and is what drives the child back to normal functioning after a TE ⁽⁸⁾. It depends on support systems found in parents, friends, family and community, the sensation of feeling safe in their environment, a high self-esteem, the perception on self-efficacy, having talents or skills in certain areas like music and art, possessing coping skills that the child can use in difficult situations, among others ⁽¹¹⁾.

The Diagnostic and Statistical Manual of Mental Disorders 5th Edition ⁽¹²⁾ defines traumatic events as part of the A1 criterion for PTSD as “exposure to actual or threatened death, serious injury, or sexual violence” by either directly experiencing the TE, witnessing the TE as it occurred to others or learning of a TE which occurred to a close family member or friend ⁽¹²⁾. Moreover medical incidents are also considered as TE if involve sudden or catastrophic events ⁽¹²⁾. The present study focuses on these medical and physical extreme stressors and defines TE as “those medical and physical conditions that were close to result in the child sudden death”.

Interestingly, a relationship between intelligence and developing future mental health adversities ⁽¹³⁾ and psychiatric comorbidity ⁽¹⁴⁾ have been established. Also, Betts et al. found that an inverse relationship exists between intelligence and future morbidity and mortality ⁽¹⁵⁾. Nevertheless, the relationship between higher intelligence scores in psychometric test and development of TE have been proposed in some literature like Breslau et al ⁽³⁾ but not confirmed in all research ^(6, 16, 17).

Intelligence does not have a unified definition. Legg et al. compile a list of definitions based on the literature available ⁽¹⁸⁾. Bingham referred to this term as follows: “the ability of an organism to solve new problems...” ⁽¹⁹⁾. Other authors, like Gottfredson defined it in a comprehensive way: “...general mental capacity that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experiences” ⁽²⁰⁾. General intelligence or “*g factor*” includes fluid intelligence (capacity to understand and solve new problems) ⁽²¹⁾ and crystallized intelligence (facts or knowledge already learned). Psychometric tests are used to measure general intelligence. The *Raven Colored Progressive Matrices Test* (RCPM) was designed to

measure general intelligence but measures more specifically fluid intelligence in children ages 5 to 12 years old. For ease of presentation on this research we will refer to general intelligence, fluid intelligence, “intelligence as measured by the RCPM” and cognitive ability as “*Intelligence*”.

The present study was done in the context of *Young Lives* (YL) International Childhood Poverty Research. YL started in the year 2002 and involved children from 4 *Low and Middle Income Countries* (LMIC): Ethiopia, India (Andhra Pradesh), Peru and Vietnam ⁽²²⁾. It included around 12 000 children divided into 2 cohorts: one called “*younger cohort*” including children between 6-18 months old born in 2001-2002 and another called “*older cohort*” (OC) which included upon enrollment children of around 8 years old, born in 1994-1995 ⁽²²⁾. YL study is divided in “*rounds*” which are periods of time, in this case every 4 years, were subject were followed-up ⁽²³⁾. *Round 1* (R1) was done in 2002 and is when data was first obtained from questionnaires to the caregivers about their children, about the children’s household and is also when the RCPM test was taken. *Round 2* (R2), done in 2006, included questionnaires about the child, their household and is also when the occurrence of TE were inquired. More information about the YL research is available on: <https://www.younglives.org.uk/content/about-us>.

Currently, several studies have explored intelligence and the subsequent development of TE. Most research on TE comes from adults, war veterans ⁽²⁴⁾ or in children under special circumstances such as: residents of developed countries ^(2-5, 7, 16, 25) or with low prevalence of child labor ^(2-5, 7, 16, 25), living in war zones or terrorism areas ^(26, 27), residing in refugee camps ⁽²⁸⁾ and survivors of natural disasters like tsunamis ^(29, 30) or earthquakes ⁽³¹⁻³³⁾. Some studies expose results without adjusting their analysis by place of residence ⁽³⁴⁾. In addition, some

reports are based on descriptive, cross-sectional, case control designs and fewer had longitudinal designs. At present time, no cohort study proving causal relationship between intelligence and future development of TE exists from community-based sample of children from LMIC out of these special circumstances.

This research objective is to answer the following question: Is intelligence as measured by the *Raven's Colored Progressive Matrices* test an associated factor to suffer TE in the future in *Young Lives* older cohort children from India and Peru? We hypothesized that *Young Lives* older cohort children with higher intelligence scores are protected against TE. To answer our hypothesis we will review the type and magnitude of the association between RCPM scores and the chance of suffering TE in the future. To achieve the main goal we will describe the intelligence scores of the children of YL in R1, determinate the prevalence of suffering TE in the children of YL in R2, correlate intelligence score assessed in *Round 1* and the probability of suffering TE during the follow-up period. A secondary objective is to determine what other socio-demographic factors are associated to suffer TE in the future in YL OC children from India and Peru.

Methods

Study Design

This is a secondary analysis of the de-identified public data base of the YL cohort study. YL started in the year 2002 and involved children from four LMIC: Ethiopia, India (Andhra Pradesh), Peru and Vietnam ⁽²²⁾. This research only involves the YL OC children from India and Peru, because the RCPM was only performed in these two countries.

Selection Criteria

Inclusion criteria contemplate YL OC children from India and Peru who solved the *Raven's Colored Progressives Matrices Test* in *Round 1*; caregivers who answered the "Household" questionnaires in *Round 1* and *Round 2*; and caregivers who answered to the outcome in *Round 2*.

Sample Size and power

The initial sampling of YL in *Round 1* was: India (n=1008) and Peru (n=714). Upon *Round 2*, OC of children caregivers who responded the questionnaires were India (n=995) and Peru (n=685) ⁽³⁵⁻³⁸⁾ and caregivers who responded the outcome on *Round 2* were: India (n=989) and Peru (n=680). Lost to follow-up proportion was 53 children (3.08%), figure 1 shows the detailed flow chart. The power of this study (92.4%) was calculated using Epidat 4.1 software considering n=1669, alpha of 5%, ratio between test populations of 10, proportion of population 1 equal to 20% and the proportion of population 2 equal to 10%.

Sampling

The exact sampling method for each country varied due to geographical and administrative differences ⁽³⁹⁾ but as a general rule it consisted of selecting 20 sentinel sites per country ⁽⁴⁰⁾ and for each site selected clustered-stratified, multi-stage, and random sampling procedures were used ⁽⁴⁰⁾.

Variables

Traumatic events, *the outcome*, was measured 4 years later from when the RCPM was taken, with the following question asked to each caregiver of OC child in *Round 2*: “In the last 4 years has (*child name*) had one or more serious illnesses or injuries when you really thought s/he might die?” The responses were: “yes or no”. And it included but where not limited to: brain injury, accidents that led to broken bones, serious burns, serious lacerations, concussion, eye/sight loss, hearing loss, poisoning, brain tumors, severe allergies, etc.

Intelligence, *the exposure*, was measured with the RCPM in *Round 1*, 4 years before the outcome. This test does not have a cultural bias nor require high verbal ability ⁽⁴¹⁻⁴³⁾. It consists of 36 items divided in 3 sets of 12 matrices each one increasing progressively in difficulty. It is specially designed for children ages from 5 to 12 years old ⁽⁴⁴⁾, and was previously administered and validated in multiples countries including India and Peru ^(45,46). Subjects of this study were 8 year old when the RCPM was taken by them. The present research uses the norms dictated by Barnabas et al. and Delgado et al. for India and Peru respectively ^(47,48). Norms of the RCPM dictates the scores for each percentile according to the age and then translates that into 5 categories: Intellectually deficient, definitely below average, intellectually average, definitely above average and intellectually superior ⁽⁴⁸⁾.

Important associated factors for the development of TE were also asked in *Round 1* and were as follows: gender, age, country, place of residence, wealth index ⁽⁴⁹⁾, type of school, marital status of the caregiver, events that decreased the economic household welfare for the last 3 years and a traumatic events with the same question as the outcome. The multivariate analysis was adjusted as referred in the statistical analysis section.

Procedures

All instruments used in YL have been the result of pilots and validations in the countries and languages which took part of YL research ⁽⁵⁰⁾. For each country there were field teams consisting of a supervisor and field workers who were trained in applying the questionnaires used in YL cohort study ⁽⁵¹⁾. Data quality control was done by YL research team with double data entry ⁽⁵²⁾. When some discrepancy was founded, corrections were performed using the physical questionnaire copy ^(51, 52).

Statistical analysis

The analysis was done using Stata® 13 MP version. Descriptive analysis for categorical variables was done using percentages and for numerical variables the mean and standard deviation (SD) were applied. For bivariate analysis Chi-square test was used for categorical variables and ANOVA (one-way) for numerical ones. All variables with *p-value*<0.05 were considered significant. Those with *p-value* <0.2 and those that follow an epidemiological relationship with the outcome were recognized relevant for multivariable analysis. For the adjusted analysis, relative risk (RR) was calculated with confident interval (CI) of 95% using Poisson Regression with robust variance clustered, as per sampling, by 20 sentinel sites on each country.

Ethics

YL project was approved by Oxford University Ethics Committee as well as in each country YL took part of ⁽⁵³⁾. In Peru YL cohort study was approved by “*Comité de Ética e Investigación Del Instituto de Investigación Nutricional de Lima, Perú*” ⁽⁵⁴⁾ and this research was approved by the school of medicine Ethics Committee of the “*Universidad Peruana de Ciencias Aplicadas*” (FCS/067-07-18; PI300-15). YL uses a written *informed consent* from caregivers and *informed assent* from children who took part of the study ⁽⁵⁵⁾. YL gathered a database that is provided to researchers without identifiers ⁽⁵³⁾.

Results

In R1 1722 children's caregivers filled the questionnaires 4 year later: 1681 were followed up and 1669 answered the outcome and performed the RCPM. Of these, 59.26% were from India and 40.74% from Peru. Gathering both countries 50.93% were males. The mean age upon enrollment was 95.53 months old, around 7.96 years old (SD: +/- 3.88 months), 44.99% reside in rural locations. Wealth index was divided into tertiles: 23.93% corresponding to low tertile, 35.66% to middle and 40.41% to high tertile; 82.73% children attended public schools; 90.35% of children had caregivers with a permanent partner and 56.71% households endured an event that decrease their economic welfare. RCPM categories were as follows: 11.38% were intellectually deficient, 17.32% definitely below average, 37.33% intellectually average, 22.95% definitely above average and 11.02% intellectually superior. Before R1 the prevalence of TE was 13.36% and at R2 the prevalence was 21.27%. Socio-demographic variables by country are displayed in table 1.

The bivariate analysis showed that Indian children were more often expose to TE, 24.27% vs. 16.91% of Peruvian children ($p<0.001$). Children who lived in rural areas were more prone to suffer a TE, 25.95% against 15.60% of urban residents ($p<0.001$). Wealth index was also related to TE with 26.13% from the low tertile against 23.10% and 16.82% for the middle and high tertiles respectively ($p=0.001$). A relationship was found between TE and the type of school children were enrolled, 22.21% of children who attended public schools suffered a TE against 16.20% who came from private ones ($p=0.02$). Moreover, children who had an event that decreased the economic household welfare suffer more TE 24.84% vs. 16.62%

from children that didn't ($p < 0.001$). Children who endure a TE before R1 tend to suffer more TE during the follow-up period than children without history of past TE 27.35% vs. 20.33% ($p = 0.02$). RCPM score was not related to TE same as gender, age and marital status of the caregiver. The complete bivariate analysis is shown in table 2.

Relative risks (RR) were calculated for all variables considered significant in the bivariate analysis (table 2) and the results are shown in table 3 crude estimate. Country of residence and type of school were not significant ($p > 0.05$). RCPM categories were not significant either but were included on the multivariate adjusted estimate. After adjusting for significant variables of the bivariate analysis we found that: 1) children who lived in rural locations were at risk of enduring a TE $p = 0.03$ (RR 1.49; 95% CI: 1.05-2.11); 2) having history of TE before R1 was a risk factor for living a TE during the follow up period between R1 and R2 $p = 0.01$ (RR 1.40; 95% CI: 1.09-1.78). After the adjustment no relationship was found between other variables and the development of TE. The complete multivariate analysis is shown in table 3.

Discussion

Psychological reactions and factors associated to TE in children have been studied for over 2 decades ⁽⁵⁶⁾. Although there is plenty research from developed countries and from cross sectional or retrospective data, much less information is known from developing countries. Hence, longitudinal data from LMIC is a priority for a better understanding of children's health adversities. The main findings of the present research are the following: 1) before enrollment when YL children OC from India and Peru were 8 years old, around 1 out of 10 children had already suffered a TE; 2) after the 4 years of follow up the prevalence of TE was around 2 out of 10 children; 3) our hypothesis was rejected because before and after adjusting for associated factor intelligence as measured by the RCPM was not related to TE; 4) living in rural locations was a risk factor for suffering a TE; 5) history of a TE before enrollment was a risk factor for TE during follow-up; 6) no association was established between other variables including: country of residence, gender, age, wealth index, type of school the children attended, caregiver marital status, events that decreased a household economy welfare and future TE.

The prevalence of exposure to TE in children greatly differs between studies. Surprisingly, our results agree with the German research by Perkonigg et al. who found a prevalence of TE of around 21% in their sample age 14-24 years old ⁽⁴⁾ and also with one of Costello et al. where 25% of adolescents suffered a TE ⁽²⁵⁾. In contrast, our cohort reported more TE at age 8 than Storr et al. who stated that the occurrence of TE at age 7 was less than 1% ⁽¹⁶⁾. On the contrary, our population prevalence of TE fell below the data from previous research taken

part in the US ^(2,3,5), Bangladesh ⁽⁵⁷⁾ and Mexico ^(34,58). They all reported a prevalence of TE over 60% in their respective samples. These difference merits more than one explanation. First, children from YL OC were around 12 years old at time the outcome was measured when they haven't reached the peak prevalence rate for TE which starts to increase drastically at around 16-19 years old ⁽²⁾ or 16-18 years old ⁽¹⁶⁾. Another cohort study by Copeland et al. found that trauma exposure was more common in adolescence than in childhood ⁽⁵⁾. Second, methodological aspects inherent to the YL study in which the outcome was asked to the child's caregiver rather than the children themselves can lead to bias due to underestimation of TE exposure. Third, Costello et al. lifetime prevalence of TE only took into consideration the more extreme stressors types of TE, which definitively underestimate the global TE prevalence his team mentions ⁽²⁵⁾. Forth, traumatic events, injuries and accidents are highly associated with child labor. Although in Peru child labor is declining from 29% in the year 2001 ⁽⁵⁹⁾ to around 23.4% in the year 2011, still over 1.5 million children are involved in a form of child labor ⁽⁶⁰⁾. More than half of child laborers reside in rural areas and the most prevalent activity in these areas is agriculture ^(59,60). In India child labor is also declining but the prevalence is still around 12% of children and the majority of child laborers occur in rural locations ⁽⁶¹⁾, the decline in India's child labor also applies to Andhra Pradesh where new laws discourage child labor ⁽⁶²⁾. This has to be taken into consideration as a conditioning factor for the prevalence of TE in this population.

Intelligence has been linked to multiple childhood outcomes and adversities ⁽¹³⁻¹⁵⁾, including TE ^(3,6,16,17). Unexpectedly, we found no association between intelligence and future TE in the YL OC children from Peru and India when analyzed independently or after adjusting for other associated factors. In accordance with our results, Saigh et al. did not find any

association between Intelligence and TE in children ⁽¹⁷⁾ and the same was reported by Koenen et al. who found no relationship between neurodevelopmental characteristics and TE ⁽⁶⁾. Conversely, other researchers highlighted that high intelligence scores are protective factors for TE ⁽³⁾ or that intelligence is only related to some types of TE like assaultive violence and not others ⁽¹⁶⁾. The discrepancies above could be explain by different instruments used on the studies to evaluate intelligence or cognitive ability and different criteria on how TE was assessed. A direct pathway of the interaction between intelligence and future TE in children is not clearly understood yet ^(3, 6, 15, 63), as personal, familial, socioeconomic and demographic factors may interact each other causing confusion that cannot be discarded. But, previous research hypothesized that high intellectual quotient might have a direct impact on reducing TE by giving the children the resources to successfully avoid or prevent them ⁽³⁾. Other explanation is given from research that tested different aspects of intelligence, in those studies only subjects with high scores in the verbal subset of the intelligence tests had a lower risk of TE and PTSD ⁽¹⁵⁾. This authors explain that subjects with high verbal scores may have more cognitive resources ⁽⁶⁾ or a general capacity ⁽⁶³⁾ to translate their trauma into a narrative ⁽⁶⁾ and make a positive meaningful experience ^(15, 16, 63).

The place of residence has been proposed as a demographic associated factor to suffer future TE ⁽³⁾ and injuries ^(22, 39) in children though results vary across research. Our study established that living on rural locations was a risk factor for enduring future TE; the association was maintained with only a slight attenuation after adjusting for other associated factors, same as previous report from Bangladesh where children injuries were more frequent and serious in rural areas. In this case probably as a result of chemicals and machinery used for agriculture around the studied areas ⁽⁶⁴⁾. In contrast, two studies merit attention: one by Howe et al. from

YL children carried out with the younger YL cohort found no association between residing in urban or rural areas and injuries in Peru or India ⁽³⁹⁾ and the other by Kataoka et al. also using the YL younger cohort but on Round 3 found an association between place of residence and injuries in the bivariate analysis only and because of their study design his team could not prove directionality of the association ⁽²²⁾. The differences between these results and ours may be explained again as how injuries and TE were measured. As opposed to Howe et al. who included injuries of diverse etiology and severity ⁽³⁹⁾, our outcome only considered TE as those that threaten the child's life. As stated before, other reports suggest an association between agriculture, child labor, living on rural locations and injuries, accidents and traumatic events. In addition, data from developed countries from Breslau et al. concluded that inner city residing children and adolescents were more prone to suffer TE in comparison to suburban residents ⁽³⁾.

The cumulative negative effect of TE and its relationship with adverse childhood outcomes has been widely studied ^(58, 65-67). After controlling for confounding variables, our analysis indicates that children who suffer a TE before R1 have 1.4 times the risk of enduring a TE in the four years of follow up than those children that did not suffer a TE before R1. Breslau et al. concludes similarly that having a previous TE doubled the probability of having a second TE, although their subjects were adults ⁽⁶⁸⁾. Many studies relate the cumulative effect of TE and the burden of developing PTSD ^(2-5, 34, 68) but their objective was focused on the association between multiples traumas and later development of PTSD not as a risk factor for re-exposure to new TE. The common denominator in those studies is that subjects with prior trauma are prone to suffer another TE; be more likely to develop PTSD; or be at risk for other adversity in life because of the multiple trauma exposures. Finally, other variables

may play a role in suffering a second TE like dysfunctional families or adverse household environment which can lead for a child to be exposed to repetitive trauma.

There are two significant strengths on our study: 1) the prospective nature inherent of a cohort design, which enables causality and directionality of the associations; and 2) being the first research that seeks for the association between intelligence and other associated factor for development of TE in community-based samples from LMIC like India and Peru out of special circumstances. As in any other researches, our study was not exempt from limitations: 1) other associated factors (confounding variables) like: psychiatric disorders comorbidity; parental or caregiver's mental health; and household environment) were not available for analysis; 2) the sample from YL study may not be representative of each country; 3) the outcome was asked to the caregiver which can lead to bias on reporting what constituted a TE or underestimation of TE, which can vary by country or place of residence; 4) there was a short follow up period and children had not reached peak prevalence found in other studies which can account to the prevalence differences across studies; 5) not all types of TE were taken into account by the outcome question. All of the above makes it difficult to compare results among the different studies and generalize the results. Nonetheless, no other data relating intelligence and TE is available on these countries making it a start point for further inquiries.

Conclusion and recommendation

In conclusion, intelligence as measured by the RCPM is not an associated factor to suffer traumatic events in *Young Lives* older cohort of children from India and Peru, however living in rural places and history of past TE were significant risk factors for future TE. At the age of 12 years old around 20% of the children have already suffered TE. Given these results, the hypothesis from previous research that TE don't occur at random and in contrast there are risk factor is highlighted. Living on rural locations and having history of past TE are both risk factor for future development of TE making this two factor markers on how children at risk may be identified. We recommend that future research should focus on identify more socioeconomic, social, familial and individual risk or protective factors for exposure to TE in LMIC community-based samples as this research is one of the firsts attempts to do so. A more widespread intelligence instrument like the Wechsler Intelligence Scale for Children may be used for future studies and the relationship between intelligence and TE should be studied in a more comprehensive way in the context of other LMIC. From a public health standpoint models that include preventive measures like counseling to parents, educators and caregivers can be made to detect children at risk and reduce the burden of TE and adversities during childhood.

Conflict of interest

Authors declare no conflict of interests.

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References

1. Dyer KA. Living through and surviving traumatic events. Medical wellness archives. [Internet]. 2005;2(2). [Cited 2018, May 28]. Available at: http://medicalwellnessassociation.info/articles/traumatic_events.htm
2. Breslau N, Wilcox HC, Storr CL, Lucia VC, Anthony JC. Trauma exposure and posttraumatic stress disorder: A study of youths in urban America. *J Urban Heal*. 2004;81(4):530–44.
3. Breslau N, Lucia V, Alvarado GF. Intelligence and Other Predisposing Factors in Exposure to Trauma and Posttraumatic Stress Disorder. *Arch Gen Psychiatry*. 2006;63:1238–45.
4. Perkonigg A, Kessler RC, Storz S, Wittchen HU. Traumatic events and post-traumatic stress disorder in the community: prevalence, risk factors and comorbidity. *Acta Psychiatr Scand*. 2000;101(1):46–59.
5. Copeland WE, Keeler G, Angold A, Costello EJ. Traumatic events and posttraumatic stress in childhood. *Arch Gen Psychiatry*. 2007;64(5):577–84.
6. Koenen KC, Moffitt TE, Poulton R, Martin J, Caspi A. Early childhood factors associated with the development of post-traumatic stress disorder: results from a longitudinal birth cohort. *Psychol Med*. 2007;37(2):181–92.
7. Afifi TO, McMillan K a., Asmundson GJG, Pietrzak RH, Sareen J. An examination of the relation between conduct disorder, childhood and adulthood traumatic events, and posttraumatic stress disorder in a nationally representative sample. *J Psychiatr Res*. 2011;45(12):1564–72.
8. American Psychological Association. Children and Trauma Update for Mental Health Professionals. [Fact Sheet]. 2008. [Cited 2018, December 05]. Available at: <https://www.apa.org/pi/families/resources/update.pdf>
9. Morin A. The Effects of Childhood Trauma. [Internet]. 2018. [Cited 2018, December 04]. Available at: <https://www.verywellmind.com/what-are-the-effects-of-childhood-trauma-4147640>
10. Dye H. The Impact and long-term effects of childhood trauma. *Journal of Human Behavior in the Social Environment*. 2018;28(3) :381-392
11. National Child Traumatic Stress Network. Resilience and Child Traumatic Stress. [Fact Sheet]. 2016. [Cited 2018, December 05]. Available at: https://www.nctsn.org/sites/default/files/resources/resilience_and_child_traumatic_stress.pdf
12. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 2013. 5th Edition. Pages : 271-280.
13. Gale CR, Hatch SL, Batty GD, Deary IJ. Intelligence in childhood and risk of psychological distress in adulthood: The 1958 National Child Development Survey and the 1970 British Cohort Study. *Intelligence*; 2009;37(6):592–9.

14. Batty GD, Mortensen EL, Osler M. Childhood IQ in relation to later psychiatric disorder Evidence from a Danish birth cohort study. *British Journal of Psychiatry*. 2005;187:180-181
15. Betts KS, Williams GM, Najman JM, Bor W, Alati R. Pre-trauma verbal ability at five years of age and the risk of post-traumatic stress disorder in adult males and females. *J Psychiatr Res*. 2012;46(7):933–9
16. Storr CL, Ialongo NS, Anthony JC, Breslau N. Childhood antecedents of exposure to traumatic events and posttraumatic stress disorder. *Am J Psychiatry*. 2007;164(1):119–25.
17. Saigh PA, Yasik AE, Oberfield RA, Halamandaris PV, Bremner JD. The intellectual performance of traumatized children and adolescents with or without posttraumatic stress disorder. *J Abnorm Psychol*. 2006;115(2):332-40.
18. Legg S, Huter M. A Collection of Definitions of Intelligence. [Technical report]. 2007. [Cited 2018, December 04]. Available at: <https://arxiv.org/pdf/0706.3639.pdf>
19. Bingham WV. Aptitudes and Aptitude testing. Harper & Brothers, New York. 1937. Page: 36.
20. Gottfredson LS. Mainstream Science on Intelligence: An Editorial with 52 Signatories, History, and Bibliography. 1997. *Intelligence*;24(1):13-23.
21. Martinez ME. Education as the Cultivation of Intelligence. Lawrence Erlbaum Associates. New Jersey. 2000.
22. Kataoka E, Griffin M, Durham J. The characteristics of, and risk factors for, child injuries in Andhra Pradesh, India: the Young Lives Project. *Int Health*. 2015;1–8.
23. Young Lives. A guide to Young Lives Research. [Internet]. 2017. [Cited 2018, May 25]. Available at: http://www.younglives.org.uk/sites/www.younglives.org.uk/files/GuidetoYLResearch_0.pdf
24. Kremen WS, Koenen KC, Boake C, Purcell S, Eisen SA, Franz CE, et al. Pretrauma Cognitive Ability and Risk for Posttraumatic Stress Disorder a Twin Study. *Arch Gen Psychiatry*. 2007;64:361-368.
25. Costello EJ, Erkanli A, Fairbank JA, Angold A. The prevalence of potentially traumatic events in childhood and adolescence. *J Trauma Stress*. 2002;15(2):99–112.
26. Manzanero AL, Crespo M, Barón S, Scott T, Sofián EA, Hemaid F. Traumatic Events exposure and psychological trauma in children victims of war in the Gaza strip. *J Interpers Violence*. 2017; DOI: 10.1177/0886260517742911.
27. Sirin S, Aber JL. Increasing understanding for Syrian refugee children with empirical evidence. 2018;13(1):1-6.
28. Oppedal B, Özer S, Sirin S. Traumatic events, social support and depression: Syrian refugee children in Turkish camps. 2018;13(1):46-59.
29. Piyasil V, Ketuman P, Plubrukarn R, Jotipanut V, Tanprasert S, Aowjinda S, et al. Post traumatic stress disorder in children after tsunami disaster in Thailand: 2 years follow-up. *J Med Assoc Thai*. 2007 Nov;90(11):2370-6.

30. Piyasil V, Ketumarn P, Prubrukarn R, Ularntinon S, Sitdhiraksa N, Pithayaratsathien N, et al. Post-traumatic stress disorder in children after the tsunami disaster in Thailand: a 5-year follow-up. *J Med Assoc Thai*. 2011 Aug;94 Suppl 3:S138-44.
31. Andrades M. Trastorno de estrés posttraumático y crecimiento posttraumáticos en niños y adolescentes afectados por el terremoto del año 2010 en Chile. 2016. Tesis doctoral Universidad Complutense de Madrid.
32. Jia Z, Shi L, Duan G, Liu W, Pan X, Chen, et al. Traumatic experiences and mental health consequences among child survivors of the 2008 Sichuan earthquake: a community-based follow-up study. *BMC public health*. 2013; 13: 104.
33. Raccanello D, Burro R, Hall R. Children's emotional experience two years after an earthquake: An exploration of knowledge of earthquakes and associated emotions. *PLoS One*. 2017; 12(12): e0189633.
34. Orozco R, Borges G, Benjet C, Medina-Mora ME, López-Carrillo L. Traumatic life events and posttraumatic stress disorder among Mexican adolescents: results from a survey. *SaludPublica Mex*. 2008;50Suppl 1:S29-37.
35. Woldehanna T, Alemu M, Tekie A. Young Lives Ethiopia Round Two survey report. [Internet]. Young Lives [Cited 2018, May 28]. 2008. Available at: <https://younglives.org.uk/sites/www.younglives.org.uk/files/YL-CR2-Ethiopia-2008.pdf>
36. Galab S, Reddy P, Himaz R, Young Lives University of Oxford D of ID. Young Lives Round 2 Survey Report. Initial Findings: Andhra Pradesh, India [Internet]. Young Lives [Cited 2018, May 28]. 2008. Available at: <http://www.younglives.org.uk/sites/www.younglives.org.uk/files/YL-CR2-India-2008.pdf>
37. Cueto S, Escobal J, Penny M, Ames P. Tracking Disparities: Who Gets Left Behind? Initial Findings from Peru. [Internet]. Young Lives [Cited 2018, May 28]. 2011. Available at: http://www.younglives.org.uk/sites/www.younglives.org.uk/files/YL-CR3-Peru_Report.pdf
38. Duc LT, Ngoc NP, Chau TM, Tien NV, Son VT. Young Lives : Vietnam Round 2 Survey. [Internet]. Young Lives [Cited 2018, May 28]. 2008. Available at: <http://www.younglives.org.uk/sites/www.younglives.org.uk/files/YL-CR2-Vietnam-2008.pdf>
39. Howe LD, Huttly SRA, Abramsky T. Risk factors for injuries in young children in four developing countries: the Young Lives Study. *Trop Med Int Health*. 2006;11(10):1557-66.
40. Young Lives. Young Lives Survey Design and Sampling in Peru. [Internet]. 2015. [Cited 2018, May 28]. Available at: <https://www.younglives.org.uk/sites/www.younglives.org.uk/files/PER-SurveyDesign-Factsheet.pdf>
41. Cueto S, Leon J, Guerrero G, Muñoz I. Psychometric characteristics of cognitive development and achievement instruments in Round 2 of Young Lives. [Internet]. Young Lives [Cited 2018, May 28]. 2009. Available at: <https://www.younglives.org.uk/sites/www.younglives.org.uk/files/YL-TN15-Cueto-Psychometric-Characteristics.pdf>

42. Czermainski FR, Riesgo RDS, Guimarães LSP, Salles JF De, Bosa CA. Executive Functions in Children and Adolescents with Autism Spectrum Disorder. *Paidéia*. 2014;24(57):85–94.
43. Courchesne V, Meilleur A-AS, Poulin-Lord M-P, Dawson M, Soulières I. Autistic children at risk of being underestimated: school-based pilot study of a strength-informed assessment. *Mol Autism*. 2015;6(1):4–13.
44. Lynn R, Irwing P. Sex differences on the progressive matrices: A meta-analysis. *Intelligence*. 2004;32(5):481–98.
45. Lynn R, Vanhanen T. *Intelligence. A unifying construct for the social sciences*. London: Ulser Institute for Social Research. 2012.
46. Bakhiet SFA, Lynn R. A study of the IQ in Palestine. *Intelligence*. 2014;47:10–1.
47. Barnabas IP, Kapur M, Rao S. Norm development and reliability of coloured progressive matrices test. *Journal of Personality and Clinical Studies*: 1995;11(1-2):17-22.
48. Delgado A, Escurra LM, Bulnes M, Quesada MR. Estudiopsicométrico del test de matrices progresivas de Raven a colores en estudiantes de primaria de Lima metropolitana. *Revista de Investigacion en psicología*; 2002;5(2):43-54.
49. Kumra, N. Young Lives Technical Note N°2: An Assessment of the Young Lives Sampling Approach in Andhra Pradesh, India [Internet]. Department of International Development. University of Oxford [citado 2015, Octubre 22]. 2008 Disponible en: <http://www.younglives.org.uk/publications/TN/assessment-young-lives-sampling-approach-india/an-assessment-of-the-young-lives-sampling-approach-in-andhra-pradesh-india>
50. Young Lives. A Guide to Young Lives Research: Piloting – Testing Instruments and Training Field Teams. [Internet]. Young Lives [cited 2018, May 25]. 2017 Available at: <http://www.younglives.org.uk/sites/www.younglives.org.uk/files/GuidetoYLResearch-S10-Piloting.pdf>
51. Young Lives. A Guide to Young Lives Research: Planning and Managing Fieldwork. [Internet]. Young Lives [Cited 2018, May 28]. 2017. Available at: <http://www.younglives.org.uk/sites/www.younglives.org.uk/files/GuidetoYLResearch-S11-Fieldwork.pdf>
52. Young Lives. A Guide to Young Lives Research: Computer-assited Personal Interviewing. [Internet]. Young Lives [Cited 2018, May 28]. 2017. Available at: <http://www.younglives.org.uk/sites/www.younglives.org.uk/files/GuidetoYLResearch-S13-CAPI.pdf>
53. Young Lives. A Guide to Young Lives Research: Research Ethics. [Internet]. Young Lives [Cited 2018, May 28]. 2017. Available at: <http://www.younglives.org.uk/sites/www.younglives.org.uk/files/GuidetoYLResearch-S4-ResearchEthics.pdf>
54. Presto EC, Ariana P, Penny ME, Frost M. Prevalence of childhood overweight and obesity and associated factors in Peru. *Rev PanamSaludPublica*. 2015; 38(6): 472-478.

55. Carrillo-Larco RM, Bernabé-Ortíz A, Miranda JJ. Short sleep duration and childhood obesity: cross-sectional analysis in Peru and patterns in four developing countries. *PLoS One*. 2014; 13;9(11).
56. Trickey D, Siddaway AP, Meiser-Stedman R, Serpell L, Field AP. A meta-analysis of risk factors for post-traumatic stress disorder in children and adolescents. *ClinPsychol Rev*. 2012;32(2):122-38.
57. Deeba F, Rapee RM. Prevalence of traumatic events and risk for psychological symptoms among community and at-risk children and adolescents from Bangladesh. *Child Adolesc Ment Health*. 2015; [Internet]. 2015;20(4):218-24.
58. Benjet C, Borges G, Medina-Mora ME, Zambrano J, Cruz C, Méndez E. Descriptive epidemiology of chronic childhood adversity in Mexican adolescents. *J Adolesc Health*. 2009;45(5):483-9.
59. Dirección General de Salud Ambiental. Plan de Acción. Prevención y Erradicación del Trabajo Infantil con enfoque del Sector Salud. [Internet]. 2008. [Cited 2018, December 03]. Available at: <http://www.digesa.minsa.gob.pe/DSO/informes/Plan%20de%20Accio n%20Prevencion%20y%20Erradicacion%20del%20Trabajo%20Infantil.pdf>
60. Torres Slimming, PA, Nino Guerrero A, Reyes E, Cárcamo C. Trabajo infantil y riesgos en salud. Estudio exploratorio en tres regiones del Perú. Lima: Desco, DyA, WL. 2015.
61. UNICEF. Child labour. Global Databases. [Internet]. 2017 [Cited 2018, December 02]. Available at: <https://data.unicef.org/topic/child-protection/child-labour/>
62. Venkateswarlu D. The price of less child labour and higher wages. Do seed companies in India enable their farmers payment of legal minimum wages? Indian Committee of Netherlands. 2014. Available at : <http://www.indianet.nl/pdf/ThePriceOfLessChildLabourAndHigherWages.pdf>
63. Breslau N, Chen Q, Luo Z. The role of intelligence in Posttraumatic stress disorder : Dos it vary by trauma severity? *Plos One*. 2013;8(6):e65391
64. Rahman A, Rahman AF, Shafinaz S, Linnan M. Bangladesh Health and Injury Survey Report on Children. Directorate General of Health Services, Ministry of Health And Family Welfare, Government of the People's Republic of Bangladesh. 2005. Pages: 84-85, 93-94.
65. Cloitre M, Stolbach BC, Herman JL, van der Kolk B, Pynoos R, Wang J, Petkova E. A developmental approach to complex PTSD: childhood and adult cumulative trauma as predictors of symptom complexity. *J Trauma Stress*. 2009;22(5):399-408.
66. Crusto CA, Whitson ML, Walling SM, Feinn R, Friedman SR, Reynolds J, Amer M, Kaufman JS. Posttraumatic stress among young urban children exposed to family violence and other potentially traumatic events. *J Trauma Stress*. 2010;23(6):716-24.
67. Hodges M, Godbout N, Briere J, Lanktree C, Gilbert A, Kletzka NT. Cumulative trauma and symptom complexity in children: a path analysis. *Child Abuse Negl*. 2013;37(11):891-8.
68. Breslau N, Davis GC, Andreski P. Risk factors for PTSD-related traumatic events: a prospective analysis. *Am J Psychiatry*. 1995;152(4):529-35.

Table 1. Socio-demographic characteristics of the sample.

Countries		India	Peru
Subjects n (%) [*]	n=1669	989 (59.26)	680 (40.74)
Gender [n:1669]	Male	485 (49.04)	365 (53.68)
	Female	504 (50.96)	315 (46.32)
Age in months [n:1669]	Mean (SD ^{**})	95.75 (3.82)	95.23 (3.96)
Urban/Rural residence [n:1667]	Urban	243 (24.62)	507 (74.56)
	Rural	744 (75.38)	173 (25.44)
Wealth Index [n:1663]	Low Tertile	252 (25.48)	146 (21.66)
	Middle Tertile	394 (39.84)	199 (29.53)
	High Tertile	343 (34.68)	329 (48.81)
Public/Private school [n:1644]	Public	742 (76.65)	618 (91.42)
	Private	226 (23.35)	58 (8.58)
Marital Status of Caregiver [n:1669]	Permanent partner	941 (95.15)	567 (83.38)
	Divorced or separated	3 (0.30)	73 (10.74)
	Single	8 (0.81)	19 (2.79)
	Widowed	37 (3.74)	21 (3.09)
Any events that decreased household economic welfare in last 3 years [n:1668]	Yes	550 (55.61)	396 (58.32)
	No	439 (44.39)	283 (41.68)
Serious illness or injury where you thought child might die (R1 ⁺) [n:1669]	Yes	62 (6.27)	161 (23.68)
	No	927 (93.73)	519 (76.32)
Serious illness or injury in last 4 years (R2 ⁺⁺) [n:1669]	Yes	240 (24.27)	115 (16.91)
	No	749 (75.73)	565 (83.09)
RCPM ^Δ categories [n:1669]	Intellectually deficient	34 (3.44)	156 (22.94)
	Definitely below average	72 (7.28)	217 (31.91)
	Intellectually average	476 (48.13)	147 (21.67)
	Definitely above average	290 (29.32)	93 (13.68)
	Intellectually superior	117 (11.83)	67 (9.85)

*Whole Number (percentages)

^{**}Standard Deviation⁺ Young Lives Study Round 1⁺⁺Young Lives Study Round 2^ΔRaven's Colored Progressive Matrices

Table 2. Bivariate analysis: associated factors to suffer traumatic events

Serious illness or injury in last 4 years (R2*)		Yes	No	<i>p</i> **
Country n (%) ⁺ [n:1669]	India	240 (24.27)	749 (75.73)	< 0.001
	Peru	115 (16.91)	565 (83.09)	
Gender [n:1669]	Male	195 (22.94)	655 (77.06)	0.09
	Female	160 (19.54)	659 (80.46)	
Age in months [n:1669]	Mean	95.37	95.58	0.92
	SD ⁺⁺	3.90	3.88	
Urban/Rural Site [n:1667]	Urban	117 (15.60)	633 (84.40)	< 0.001
	Rural	238 (25.95)	679 (74.05)	
Wealth Index [n:1663]	Low Tertile	104 (26.13)	294 (73.87)	0.001
	Middle Tertile	137 (23.10)	456 (76.90)	
	High Tertile	113 (16.82)	559 (83.18)	
Public/Private school [n:1644]	Public	302 (22.21)	1058 (77.79)	0.02
	Private	46 (16.20)	238 (83.80)	
	Permanent partner	325 (21.55)	1183 (78.45)	
Marital Status of Caregiver [n:1669]	Divorced or separated	11 (14.47)	65 (85.53)	0.53
	Single	6 (22.22)	21 (77.78)	
	Widowed	13 (22.41)	45 (77.59)	
Any events that decreased household economic welfare in last 3 years [n:1668]	Yes	235 (24.84)	711 (75.16)	< 0.001
	No	120 (16.62)	602 (83.38)	
Serious illness or injury where you thought child might die (R1‡) [n:1669]	Yes	61 (27.35)	162 (72.65)	0.02
	No	294 (20.33)	1152 (79.67)	
RCPM^Δ categories [n:1669]	Intellectually deficient	34 (17.89)	156 (82.11)	0.19
	Definitely below average	51 (17.65)	238 (82.35)	
	Intellectually average	137 (21.99)	486 (78.01)	
	Definitely above average	94 (24.54)	289 (75.46)	
	Intellectually superior	39 (21.20)	145 (78.80)	

* Young Lives Study Round 2
** P value

⁺ Whole Number (percentages)
⁺⁺ Standard Deviation

[‡] Young Lives Study Round 1

^Δ Raven's Colored Progressive
Matrices

Table 3. Relative risks of associated factors to suffer traumatic events.

Serious illness or injury in last 4 years (R2*)

		Crude estimate			Adjusted estimate		
	Variables	RR**	95% CI ⁺	p ⁺⁺	RR	95% CI	P
	Country						
	India	1 (Reference)					
	Peru	0.70	[0.47 – 1.03]	0.07			
	Urban/Rural Site						
	Urban	1 (Reference)			1 (Reference)		
	Rural	1.66	[1.14 – 2.42]	0.01	1.49	[1.05 – 2.11]	0.03
	Wealth Index						
	Low Tertile	1 (Reference)			1 (Reference)		
	Middle Tertile	0.88	[0.66 – 1.19]	0.41	0.92	[0.69 – 1.22]	0.56
	High Tertile	0.64	[0.46 – 0.89]	0.01	0.86	[0.62 – 1.19]	0.36
	Public/Private school						
	Public	1 (Reference)					
	Private	0.73	[0.44 – 1.20]	0.21			
	Any events that decreased household economic welfare in last 3 years						
	Yes	1 (Reference)			1 (Reference)		
	No	0.67	[0.48 – 0.94]	0.02	0.75	[0.56 – 1.00]	0.05
	Serious illness or injury where you thought child might die (R1‡)						
	No	1 (Reference)			1 (Reference)		
	Yes	1.35	[1.02 – 1.77]	0.04	1.40	[1.09 – 1.78]	0.01
	RCPM^Δ categories						
	Intellectually defective	1 (Reference)			1 (Reference)		
	Definitely below average	0.98	[0.70 – 1.39]	0.94	1.08	[0.75 – 1.55]	0.68
	Intellectually average	1.23	[0.85 – 1.78]	0.27	1.22	[0.86 – 1.72]	0.27
	Definitely above average	1.37	[0.85 – 2.22]	0.20	1.36	[0.89 – 2.08]	0.16
	Intellectually superior	1.18	[0.74 – 1.90]	0.48	1.25	[0.78 – 2.01]	0.36

* Young Lives Study Round 2

** Relative risk

⁺ Confident interval

⁺⁺ P value

‡ Young Lives Study Round 1

^Δ Raven's Colored Progressive Matrices

Figure 1: Flow Chart and lost to follow-up

* YL: Young Lives

** OC: older cohort

‡ R1: Young Lives Study Round 1

‡‡ R2: Young Lives Study Round 2

^Δ Raven's Colored Progressive Matrices

^{ΔΔ} LFU: lost to follow-up