Do Literacy Skills Influence Young Adults' Health in Rural Africa? Evidence from Malawi

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The association between education and health across the life course is well known: individuals with more formal schooling are significantly healthier and live longer (for reviews see Cutler, Lleras-Muney, and Vogl 2008; Mirowsky and Ross 2003). How do even a few years of formal school in early childhood fundamentally shape individuals' health and survival in adulthood? Research on the pathways linking education and health commonly emphasizes the economic benefits (Lynch 2006; Ross and Wu 1995) and the psychological and social consequences (Chandola, Clarke, Morris, and Blane 2006; Lahelma, Martikainen, Laaksonen, and Aittomäki 2004; Mirowsky and Ross 2003; Ross and Sastry 1999; Ross and Wu 1995) of going to formal school. Surprisingly, the central purpose of formal schooling – cognitive development – is often absent from this literature (for discussion see Baker, Leon, Smith Greenaway, Collins, and Movit 2011).

In this paper, I will explore whether and how one set cognitive skills – literacy skills – influence young adults' health in a rural village in Malawi, a country with one of the lowest life expectancies in the world (World Health Organization 2010). I employ a new longitudinal study (Tsogolo la Thanzi [TLT]) of young adults in the Balaka District of Malawi to test for associations between literacy skills and general health and morbidity, and to evaluate whether comprehension of health information explains the observed associations. The data set is particularly well-suited for this investigation because it includes direct assessments of respondents' literacy skills and comprehension of health information. In preliminary analyses, I show that literacy skills are strongly associated with health, net of formal school and other sociodemographic controls. The unique impact of literacy skills on young adults' health highlights the need for demographers to incorporate cognitive skills into research on the education-health gradient.

BACKGROUND

There is increasing evidence that cognitive skills impact individuals' decisions and behaviors, and ultimately their health. Much of this work is rooted in literature on the strong associations between general intelligence and mortality (Batty, Deary, and Gottfredson 2007; Batty, Der, Macintyre, and Deary 2006; Deary 2008; Gottfredson 1997). Because general intelligence is, at least to some extent, genetically endowed, this work implies that cognition is a non-malleable, individual-trait that is not influenced by social factors.

But more recent research highlights that formal school enhances several dimensions of cognition, and argues these cognitive skills may be important in understanding the education-health gradient (Baker, Collins, and Leon 2008; Baker et al. 2011; Herd 2010; Peters, Baker, Dieckmann, Leon, and Collins 2010). Formal school is a unique environment in which children are engaged in cognitively demanding activities. And one of the central purposes of formal school – literacy – is associated with multiple dimensions of cognition. Reading is the result of abstract cognitive processes that transforms how individuals, think, reason, and solve problems. Reading requires the development of short-term memory (also referred to as working memory), which increases problem-solving efficiency and decision-making ability (Abadzi 2008; Shaywitz and Shaywitz 2008). People who can read perform better on neuropsychological tests assessing deductive reasoning, categorization, visuospatial discrimination, numeracy, and abstract speech compared to individuals who cannot read (Abadzi, Crouch, Echegaray, Pasco, and Sampe 2005). Some researchers argue that the cognitive benefits associated with acquiring literacy skills, even at a rudimentary level, may act as a "social vaccine" by shaping individuals' decision-making and behaviors, and thus ultimately their health outcomes (Baker, Collins, and Leon 2008).

Related to the cognitive benefits of literacy, evidence from Africa, Asia, and Latin America demonstrates that literacy skills increase individuals' comprehension of health information, which may be a specific way that literacy benefits health. Literacy skills enable individuals to understand printed health information in newspapers, banners, brochures, and billboards. In addition to having an increased ability to acquire new health information through printed sources, literacy skills are associated with greater

comprehension of radio-broadcasted health messages (Dexter, LeVine, and Velasco 1998; Joshi 2004; Preston, Haines, and Research 1991; Schnell-Anzola, Rowe, and LeVine 2005; Stuebing 1997). That is, the cognitive benefits of literacy not only increase women's comprehension of printed information, but also their comprehension of oral information. This is particularly relevant to rural sub-Saharan African communities, where oral tradition remains strong, printed material is scarce, and the radio remains a principal source of health information (Macro International 2010).

Taken together, this work suggests that literacy will directly improve adults' health (Baker, Collins, and Leon 2008), net of other dimensions of socioeconomic status. However, the presence of this association remains unknown due to an absence of demographic research on literacy per se (LeVine, LeVine, Rowe, and Schnell-Anzola 2004; Schnell-Anzola, Rowe, and LeVine 2005). The absence of research on the health benefits of literacy is, at least in part, attributable to an underlying assumption in the demographic literature that being "literate" and being "formally educated" are equivalent. This assumption is apparent in the international standard to infer literacy from formal school background. For instance, the *United Nations Education, Scientific, and Cultural Organization (UNESCO) Statistical Yearbook* classifies individuals as "literate" if they have completed five or more years of formal school (Grosse and Auffrey 1989; Schaffner 2005; Schnell-Anzola, Rowe, and LeVine 2005). The notion of equivalence of literacy and formal schooling has led to a body of population-level and individual-level research that theoretically interchanges the two, rather than empirically investigate the unique demographic impact of both literacy and formal school history.

Connecting evidence of the potential health benefits of literacy skills to the absence of demographic research on literacy leads me to two study goals. The first goal is to evaluate whether literacy skills are associated with young adults' health, including their self-reported health and morbidity. The second goal is to assess the extent to which individuals' comprehension of health information, both printed and oral, explains these associations.

STUDY CONTEXT

Malawi is a small, southeast African country. As one of the poorest countries in the world, Malawi is coping with major health challenges, including one of the most severe AIDS epidemics. Among adults,

12 percent are HIV positive (NSO Malawi and ORC Macro 2005). HIV/AIDS is the leading cause of death in Malawi, closely followed by lower respiratory infections, malaria, tuberculosis, and diarrheal diseases. In addition to communicable diseases, non-communicable diseases also plague the country which has arising prevalence of heart disease and diabetes (World Health Organization 2010). Life expectancy is 41 years old for both women and men (World Health Organization 2010). Educational opportunities remain limited, with the majority of adults having never attended secondary school. Based on formal school history, it is estimated that approximately 60 percent of the adult population is "literate", however I am not aware of any direct estimates of literacy skills among the adult population.

DATA AND SAMPLE

Tsogolo la Thanzi [TLT] provides a unique opportunity to examine the links between literacy skills, comprehension of health information, and health among young adults in a rural African village. [1] Data collection took place in the Balaka district of Southern Malawi over nine waves between 2009 and 2012. The TLT research team randomly selected respondents to participate from a sampling frame of 15- to 25-year-olds living in the seven kilometer radius of the center of Balaka. Because the study oversampled women, 75% of respondents are females.

In the preliminary results shown here, I explore the associations between literacy skills and health cross-sectionally using wave 7 of TLT data. There were a total of 1,659 young adults enrolled in TLT at wave 7. I currently use listwise deletion to handle the 4.03% of missing data, resulting in a current analytic sample of 1,592 young adults.

MEASURES

Dependent Variables

General Health Status. The first measure of health I use in preliminary results is self-reported general health. This measure is correlated with physical, mental, and functional health measures, and is highly predictive of mortality (Idler and Benyamini 1997). Respondents were asked "How would you rate your

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[1]Tsogolo La Thanzi is a research project designed by Jenny Trinitapoli and Sara Yeatman and funded by grant (R01-HD058366) from the National Institute of Child Health and Human Development. See http://projects.pop.psu.edu/tlt for more information about this dataset, to request data access, and for replication files.

health?" Response options in Likert-type style are poor, fair, good, very good, and excellent. Because very few respondents' reported fair (2.58%) or poor (0.82%) health, I collapsed the extreme values to create a three-categorical indicator of poor/fair, good, very good/excellent health (DeSalvo, Fan, McDonell, and Fihn 2005; Idler and Kasl 1991; Kaplan and Camacho 1983). I performed two sets of supplementary analyses to evaluate if the findings were consistent when using a logistic approach (fair/poor/good versus very good/excellent) and a multinomial approach (fair/poor versus good versus very good/excellent). Findings from all models were consistent both in terms of size and statistical significance as those shown here.

Morbidity. The second measure captures respondents' burden of illness. Respondents were asked "In the past month, how many days were you too sick to go to work/school?" The open-ended responses ranged from 0 to 30 days. Because of the skewed distribution of the responses and evidence of heaping at 7 days, in current analyses I categorize individuals as having being ill for only a few days (</=6 days) (=0) versus those who were ill for a week or longer (7+ days) (=1).

Independent Variable

Literacy Skills. During my second stint of fieldwork in the spring of 2011, I collaborated with TLT's team of Malawian researchers to pilot a set of instruments that I designed to assess respondents' literacy skills. After analyzing results from the pilot study (N=200), I revised the instruments and returned to Malawi in the summer of 2011 to oversee implementation of the instruments during wave 7. The literacy assessments, in addition to the full interview, were conducted by trained interviewers in Chichewa, Malawi's official and most widely spoken language.

Because of the rural context of the research site and the limited access to formal education, I focus on very basic literacy skills: the ability to decode and comprehend simple text. To assess respondents' decoding and comprehension of basic Chichewa, interviewers show respondents a flash card with a picture and four sentences printed (in Chichewa) below it. One sentence clearly matches the picture above, whereas the other three sentences are irrelevant. The interviewer then asks the respondent to read aloud the sentence that best corresponds with the picture. This exercise was repeated four times with four distinct pictures/sentences. Interviewers then recorded whether the respondent could read all,

some or none of the words aloud and whether they appropriately chose the correct sentence. Based on this information, I currently categorize individuals as having (1) no decoding skills, (2) some decoding skills and some comprehension, (3) some decoding skills and full comprehension, and (4) full decoding skills and full comprehension.

Mediator

Comprehension of Health Information. To determine whether comprehension of health information explains the association between literacy skills and health, I use a direct assessment of respondents' comprehension of a radio health message. Interviewers read a radio health message on human papillomavirus (HPV) and cervical cancer to respondents in Chichewa. They then asked respondents a series of questions about the radio health message including describing dimensions of the message (without being prompted), resulting in a total of seven idea units that the respondents could have correctly answered (see Levine et al 2004 for a similar approach). I measure respondents' scores continuously ranging from 0 to 7 idea units. The mean score is 3.87.

Controls

To isolate the independent effect of literacy skills, I include controls for key education and economic characteristics that previous literature has established are associated with individuals' health: level of formal education (none, primary, secondary, higher education), household goods (an index of nine common household goods to approximate socioeconomic status), occupation (professional, unskilled labor, skilled labor, petty trade, housewife, other, none, student [ref.]), family size (number of siblings), and parental literacy (respondents' report of whether one or both parents were literate=1). I also control for sociodemographic characteristics including gender (female=1), age, and marital status (separated, divorced widowed, never married, married [ref.]).

ANALYTIC STRATEGY

I begin my analyses by providing the associations between years of formal schooling, literacy skills, and comprehension of health information. Next, I use ordered logistic regression to estimate the associations between literacy skills and general health and logistic regression to estimate the associations between literacy skills and morbidity. I run three models for each outcome variable: model 1 shows the zero-order

effect of literacy, model 2 introduces sociodemographic controls to assess the robustness of the associations shown in model 1, and finally, model 3 introduces comprehension of health information to assess whether or not these factors attenuate the associations shown in model 1 and model 2. I estimate the models in Stata 12 using the *ologit* and *logit* commands.

PRELIMINARY RESULTS

Table 1 provides characteristics of the young adults in the sample. As shown, there is considerably variation in young adults' self-reports of general health. Although relatively few young adults report that their health is fair/poor (3.5%), approximately one-third report good health while over 60% report very good/excellent health. In terms of morbidity, approximately 6% of the sample report having been ill for one week or more in the prior month. Furthermore, on average, young adults have limited formal schooling (<8 years), which in Malawi, is equivalent to incomplete primary school. The young adults most commonly come from large families with more than five siblings with two literate parents (67%). And as mentioned previously, the majority of the sample is female (73%).

Turning to bivariate associations, Figure 1 shows that there is high level of variability in literacy skills at each level of formal schooling, highlighting that it is problematic to infer literacy skills, even at a rudimentary level, from years of formal schooling. Although the percentage of respondents who can fully read and comprehend basic Chichewa increases linearly by level of formal schooling, there is a clear need to directly assess literacy skills in order to validate their impact.

Based on prior studies that literacy skills increase comprehension of radio health messages (LeVine, LeVine, Rowe, and Schnell-Anzola 2004; Rowe, Thapa, Levine, Levine, and Tuladhar 2005), I next evaluate whether comprehension of health information increases by level of literacy skills. Figure 2 demonstrates a clear linear association between literacy skills and comprehension of health information, further motivating my investigation of comprehension of health information as a potential mediator between literacy and health.

Turning to the multivariate findings, I find that literacy skills, even at a rudimentary level, are uniquely associated with general health and morbidity among young adults. Furthermore, this association is robust to controlling for formal schooling, and other socioeconomic and sociodemographic controls: it

is not simply going to school that leads to better health; the cognitive skills individual acquire play a critical role. Furthermore, the association is not explained by comprehension of health information, demonstrating the need to further explore pathways to explain the association.

Table 2 shows the ordered logistic regression estimates of the effect of literacy skills on young adults' general health. Model 1 shows that each increase in literacy skills is associated with a 17% increase in the odds of having better health (p<.01). The size of the association between literacy skills and general health is reduced by controls in model 2, but remains significant (p<.05). This demonstrates that the central cognitive goal of going to school – learning how to read – is independently associated with health among young adults in rural Africa. Based on prior studies, model 3 tests if comprehension of health information explains the influence of literacy on health. The results show that greater comprehension of health is not significantly associated with improved health, nor does it explain the impact of literacy on health.

The findings presented in Table 3 further demonstrate the substantial relationship between literacy and health. Model 1 shows that each unit increase in literacy skills is associated with a 24 percent reduction in the odds of experiencing an illness for one week or more in the prior month (p<.05). Model 2 shows that the inclusion of educational, economic, and social characteristics does not account for this association. Furthermore, the results in model 3 show no evidence that greater comprehension of health information explains the association between literacy and morbidity. Instead, each unit increase in literacy skills continues to be associated with a 21 percent reduction in the odds of experiencing an illness for one week or more in the prior month (p<.05).

FUTURE DIRECTION

The preliminary results shown here highlight the need for continued work on the potential impact of cognitive skills on individuals' health and wellbeing. Furthermore, the inability of comprehension of health information to explain the association demonstrates the need for further research aiming to understand what links literacy skills to better health. I will continue this line of research by: (1) incorporating the longitudinal component of the survey to assess the robustness of these associations across time; (2) making use of the multiple psychological and social indicators in TLT to explore

additional pathways linking literacy skills and health: if comprehension of information doesn't explain the association, what does?; and (3) testing interaction effects to investigate whether literacy provides the same health benefits to all young adults in this homogenous village setting. By providing a thorough investigation of whether, how, and whom literacy benefits, this paper will significantly advance our understanding of the role of cognitive skills in improving population health in developing contexts.

Tables

Table 1. Sample Characteristics of Young Adults in Malawi

Variable	%/Mean	SD
General Health		
Fair/Poor	3.5	
Good	31.1	
Very Good/Excellent	68.9	
Morbidity	5.67	
Literacy Skills	3.16	1.05
Health Comprehension		
Comprehension of Radio Health Message	3.88	2.09
Education and Economic Characteristics		
Highest Level of Formal School	7.92	2.84
Household Goods	-0.01	2.31
Occupation		
Professional	1.51	
Unskilled Labor	10.64	
Skilled Labor	2.33	
Petty Trade	15.49	
Housewife	23.8	
Other	4.6	
None	12.97	
Student (ref.)	28.66	
Siblings	5.33	2.39
Mother Can Read	69.25	
Father Can Read	86.77	
Sociodemographic Characteristics		
Female	73.87	
Age	21.48	3.29
Separated/Divorced/Widowed	7.68	
Never Married	44.46	
Married (ref.)	47.86	

Source: Wave 7 TLT ; N=1,592 young adults

Table 2. Ordered Logistic Regression Results for the Effect of Young Adults' Literacy Skills on General Health

| Variable	Model 1			Model 2			Model 3		
	OR	Coeff.	S.E.	OR	Coeff.	S.E.	OR	Coeff.	S.E.
Literacy Skills	1.17	0.16**	0.05	1.15	0.14*	0.06	1.13	0.12*	0.06
Health Comprehension									
Comprehension of Radio Health Message							1.04	0.04	0.05
Education and Economic Characteristics									
Highest Level of Formal Schooling				0.78	-0.25	0.14	0.74	-0.29	0.14
Household Goods				1.06	0.06	0.03	1.05	0.05	0.03
Occupation									
Professional				0.89	-0.12	0.46	0.88	-0.13	0.46
Unskilled Labor				0.73	-0.31	0.23	0.73	-0.32	0.23
Skilled Labor				1.40	0.34	0.42	1.42	0.35	0.42
Petty Trade				0.82	-0.19	0.22	0.82	-0.20	0.22
Housewife				0.69	-0.37	0.20	0.69	-0.37	0.20
Other				0.92	-0.09	0.29	0.91	-0.10	0.29
None				0.82	-0.20	0.20	0.83	-0.19	0.20
Student (ref.)				1.00	0.00		1.00	0.00	
Siblings				1.01	0.01	0.02	1.01	0.01	0.02
Mother Can Read				0.86	-0.15	0.13	0.86	-0.15	0.13
Father Can Read									
Sociodemographic Characteristics									
Female				1.04	0.04	0.14	1.02	0.02	0.14
Age				0.94	-0.06*	0.02	0.94	-0.06*	0.02
Separated/Divorced/Widowed				0.72	-0.33	0.23	0.73	-0.32	0.23
Never Married				0.87	-0.14	0.17	0.87	-0.14	0.17
Married (ref.)				1.00	0.00		1.00	0.00	

Source: Wave 7 TLT ; N=1,592 young adults

Table 3. Logistic Regression Results for the Effect of Young Adults' Literacy Skills on Morbidity

Variable	Model 1			Model 2			Model 3		
	OR	Coeff.	S.E.	OR	Coeff.	S.E.	OR	Coeff.	S.E.
Literacy Skills	0.76	-0.28*	0.09	0.77	-0.26*	0.11	0.79	-0.24*	0.12
Health Comprehension									
Comprehension of Radio Health Message							1.05	0.04	0.06
Education and Economic Characteristics									
Highest Level of Formal Schooling				0.92	-0.08	0.28	0.89	-0.12	0.29
Household Goods				1.05	0.05	0.06	1.04	0.04	0.06
Occupation									
Professional				1.33	0.29	0.83	1.31	0.27	0.83
Unskilled Labor				0.46	-0.78	0.59	0.46	-0.78	0.59
Skilled Labor				1.93	0.66	0.71	1.97	0.68	0.71
Petty Trade				0.97	-0.03	0.45	0.97	-0.03	0.45
Housewife				1.16	0.15	0.40	1.16	0.15	0.40
Other				0.95	-0.05	0.61	0.94	-0.06	0.61
None				1.19	0.17	0.40	1.20	0.19	0.40
Student (ref.)				1.00	0.00		1.00	0.00	
Siblings				1.00	0.00	0.05	1.00	0.00	0.05
Mother Can Read				1.05	0.05	0.25	1.05	0.05	0.25
Father Can Read									
Sociodemographic Characteristics									
Female				2.61	0.96**	0.35	2.56	0.94**	0.35
Age				1.12	0.11*	0.05	1.14	0.13*	0.05
Separated/Divorced/Widowed				1.03	0.03	0.44	1.03	0.03	0.44
Never Married				1.61	0.48	0.35	1.63	0.49	0.35
Married (ref.)				1.00	0.00		1.00	0.00	

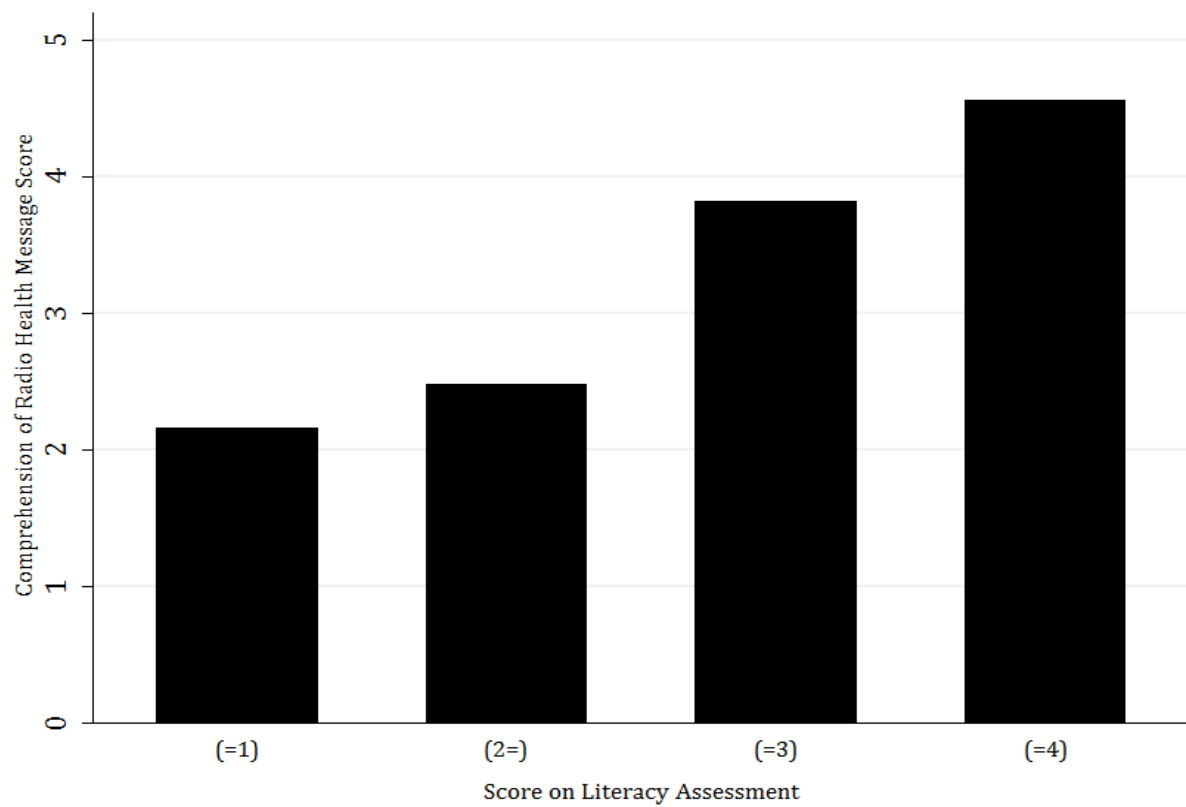Source: Wave 7 TLT ; N=1,592 young adults

Figures

Figure 1. Distribution of Literacy Skills by Highest Level of Formal Schooling
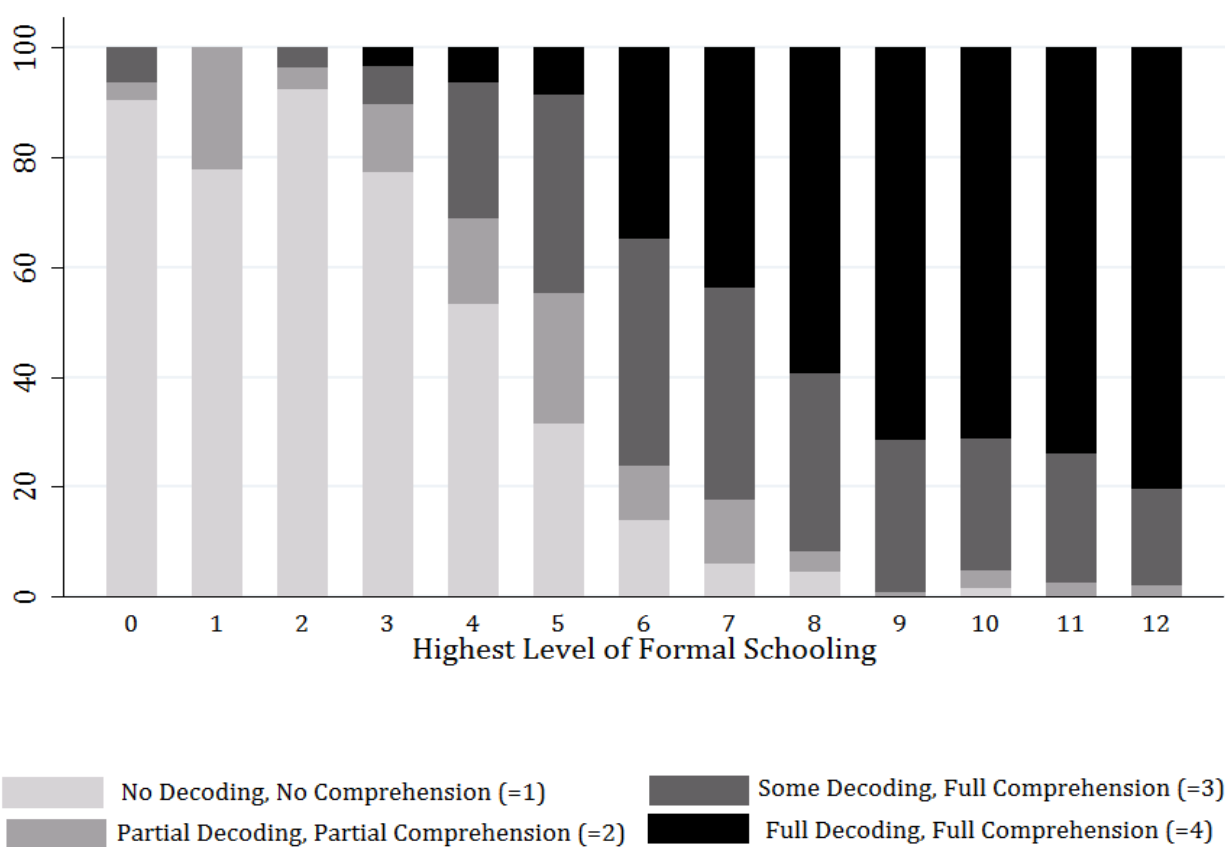
Source: Wave 7 TLT; N=1,592

Figure 2. Average Comprehension of Health Information Score by Literacy Assessment Score

Source: Wave 7 TLT; N=1,592

REFERENCES

Abadzi, H. 2008. "Efficient Learning for the Poor: New Insights into Literacy Acquisition for Children." *International Review of Education/Internationale Zeitschrift für Erziehungswissenschaft/Revue internationale l'éducation* 54:581-604.

Abadzi, H, L Crouch, M Echegaray, C Pasco, and J Sampe. 2005. "Monitoring basic skills acquisition through rapid learning assessments: A case study from Perú." *Prospects* 35:137-156.

Baker, D.P., J.M. Collins, and J. Leon. 2008. "Risk factor or social vaccine? The historical progression of the role of education in HIV and AIDS infection in Sub-Saharan Africa." *Prospects* 38:467-486.

Baker, D.P., J. Leon, E.G. Smith Greenaway, J. Collins, and M. Movit. 2011. "The education effect on population health: a reassessment." *Population and development review* 37:307-332.

Batty, G.D., I.J. Deary, and L.S. Gottfredson. 2007. "Premorbid (early life) IQ and later mortality risk: systematic review." *Annals of epidemiology* 17:278-288.

Batty, G.D., G. Der, S. Macintyre, and I.J. Deary. 2006. "Does IQ explain socioeconomic inequalities in health? Evidence from a population based cohort study in the west of Scotland." *Bmj* 332:580-584.

Chandola, T., P. Clarke, JN Morris, and D. Blane. 2006. "Pathways between education and health: a causal modelling approach." *Journal of the Royal Statistical Society: Series A (Statistics in Society)* 169:337-359.

Cutler, D.M., A. Lleras-Muney, and T. Vogl. 2008. "Socioeconomic status and health: dimensions and mechanisms." National Bureau of Economic Research.

Deary, I. 2008. "Why do intelligent people live longer?" *Nature* 456:175-176.

DeSalvo, K.B., V.S. Fan, M.B. McDonell, and S.D. Fihn. 2005. "Predicting mortality and healthcare utilization with a single question." *Health services research* 40:1234-1246.

Dexter, ER, SE LeVine, and PM Velasco. 1998. "Maternal schooling and health-related language and literacy skills in rural Mexico." *Comparative education review* 42:139-162.

Gottfredson, L.S. 1997. "Mainstream science on intelligence: An editorial with 52 signatories, history, and bibliography." *Intelligence* 24:13-23.

Grosse, RN and C Auffrey. 1989. "Literacy and health status in developing countries." *Annual Review of Public Health* 10:281-297.

Herd, Pamela. 2010. "Education and Health in Late-life among High School Graduates." *Journal of Health and Social Behavior* 51:478-496.

Idler, E.L. and Y. Benyamini. 1997. "Self-rated health and mortality: a review of twenty-seven community studies." *Journal of health and social behavior*:21-37.

Idler, E.L. and S. Kasl. 1991. "Health perceptions and survival: Do global evaluations of health status really predict mortality?" *Journal of gerontology* 46:S55-S65.

Joshi, AR. 2004. "Maternal schooling and child health: preliminary analysis of the intervening mechanisms in rural Nepal."

Kaplan, G.A. and T. Camacho. 1983. "Perceived health and mortality: a nine-year follow-up of the human population laboratory cohort." *American Journal of Epidemiology* 117:292-304.

Lahelma, E., P. Martikainen, M. Laaksonen, and A. Aittomäki. 2004. "Pathways between socioeconomic determinants of health." *Journal of Epidemiology and Community Health* 58:327-332.

LeVine, RA, SE LeVine, ML Rowe, and B Schnell-Anzola. 2004. "Maternal literacy and health behavior: A Nepalese case study." *Social Science & Medicine* 58:863-877.

Lynch, S.M. 2006. "Explaining life course and cohort variation in the relationship between education and health: the role of income." *Journal of Health and Social Behavior* 47:324-338.

Mirowsky, J. and C.E. Ross. 2003. *Education, social status, and health*: Aldine de Gruyter.

Peters, E, DP Baker, NF Dieckmann, J Leon, and J Collins. 2010. "Explaining the Effect of Education on Health." *Psychological Science*.

Preston, S.H., M.R. Haines, and National Bureau of Economic Research. 1991. *Fatal years: Child mortality in late nineteenth-century America*: Princeton University Press.

Ross, C.E. and J. Sastry. 1999. "The sense of personal control." *Handbook of the sociology of mental health*:369-394.

Ross, C.E. and C. Wu. 1995. "The links between education and health." *American sociological review*:719-745.

Rowe, M.L., B.K. Thapa, R. Levine, S. Levine, and S.K. Tuladhar. 2005. "How does schooling influence maternal health practices? Evidence from Nepal." *Comparative education review* 49:512-533.

Schaffner, J. 2005. "Subjective and objective measures of literacy: implications for current results-oriented development initiatives." *International Journal of Educational Development* 25:652-657.

Schnell-Anzola, B, ML Rowe, and RA LeVine. 2005. "Literacy as a pathway between schooling and health-related communication skills: A study of Venezuelan mothers." *International Journal of Educational Development* 25:19-37.

Shaywitz, S.E. and B.A. Shaywitz. 2008. "Paying attention to reading: the neurobiology of reading and dyslexia." *Development and psychopathology* 20:1329-1349.

Stuebing, KW. 1997. "Maternal schooling and comprehension of child health information in urban Zambia: Is literacy a missing link in the maternal schooling-child health relationship?".