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Greater years of maternal schooling and higher scores on academic achievement tests are independently associated with improved management of child diarrhea by rural Guatemalan mothers

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Abstract

Background—Appropriate home management can alleviate many of the consequences of diarrhea including malnutrition, impaired development, growth faltering, and mortality. Maternal cognitive ability, years of schooling, and acquired academic skills are hypothesized to improve child health by improving maternal child care practices, such as illness management.

Methods—Using information collected longitudinally in 1996–1999 from 466 rural Guatemalan women with children < 36 months, we examined the independent associations between maternal years of schooling, academic skills, and scores on the Raven's Progressive Matrices and an illness management index (IMI).

Results—Women scoring in the lowest and middle tertiles of academic skills scored lower on the IMI compared to women in the highest tertile (−0.24 [95%CI: −0.54, 0.07]; −0.30 [95%CI: −0.54, −0.06], respectively) independent of sociodemographic factors, schooling, and Raven's scores. Among mothers with less than one year of schooling, scoring in the lowest tertile on the Raven's Progressive Matrices compared to the highest was significantly associated with scoring one point lower on the IMI (−1.18 [95% CI: −2.20, −0.17]).

Conclusions—Greater academic skills were independently associated with maternal care during episodes of infant diarrhea. Schooling of young girls and/or community based programs that provide women with academic skills such as literacy, numeracy and knowledge could potentially improve mothers' care giving practices.

Keywords

Diarrhea; illness management; maternal schooling; Guatemala; academic skills; Raven's scores

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INTRODUCTION

The World Health Organization (WHO) and United Nations Children's Fund (UNICEF) recommend a series of "best practices" for the home management of child illness (1). Appropriate compliance with these recommendations, such as increased feeding, provision of oral rehydration therapy (ORT), and timely health seeking, reduces the risk of malnutrition, dehydration, and death (1, 2).

Duration of maternal schooling is associated with child care practices during illnesses and it is hypothesized that this is one mechanism by which maternal schooling may reduce child morbidity and mortality (3, 4). Sequelea of schooling include increased acceptance of modern practices, acquisition of academic skills and knowledge, and enhanced problem solving abilities (5–7). However, schooling may in part be determined by innate cognitive ability, also known as intelligence or "G", the components of which include such items as mental processing speed, reasoning, working memory, pattern recognition, and problem solving (8–10). Because innate ability is associated with greater schooling achievement (11), it is plausible that innate cognitive ability, rather than schooling and schooling-acquired traits per se, underpins the relationship of schooling with child health outcomes (12, 13). Thus it remains critical to unpack the independent contributions of cognitive ability, schooling, and academic skills traditionally acquired through schooling to mothers' care of their children's illness.

We used data collected longitudinally on illness management and health seeking practices during diarrhea to develop an index of appropriateness of home management of child diarrhea and to examine the independent and interactive associations of this index with cognitive ability, years of schooling, and academic skills.

METHODS

Study Setting, Study Population and Design

From March 1996 to September 1999, investigators from Emory University and the Institute of Nutrition of Central America and Panama (INCAP) conducted a study in four villages of mixed Spanish-Mayan descent, located 40–110 km east of Guatemala City, Guatemala. Pregnant women and women with children less than 36 months were eligible to participate. Children participated until they reached 36 months or end of study, whichever occurred earlier. Institutional review boards at INCAP and Emory University approved the study protocols; all participants provided informed consent. Detailed descriptions of the villages and their selection are published elsewhere (14).

Diarrhea Morbidity Assessment

Morbidity assessment was performed every 15 days using a 19 day recall method to ensure overlap of days (15). Trained field workers visited the homes and recorded information on precoded forms regarding signs, symptoms, duration of illnesses, and beginning and ending dates of illness episodes. The morbidity recall was previously validated in this population by

a physician and demonstrates adequate sensitivity and specificity for diarrhea (66% and 99%, respectively) (14).

Definitions of Diarrhea

Diarrhea was defined as 3 or more loose/watery stools in a 24 hour period preceded by 24 hours of diarrhea free time. Episode seve frity was categorized as mild, moderate or severe based on maternal perception, with the exception that all episodes accompanied by mucus or blood in the stools, vomiting, or fever were classified as severe. We summarized data as child-specific incident episodes and duration of episodes.

Illness Management Index (IMI)

If a child experienced an incident episode of diarrhea during the previous two weeks then field workers questioned mothers regarding their perceptions of the cause of the illness and their home care and illness management practices during the episode. Using questionnaires that incorporated pre-coded and open-ended responses, mothers were queried regarding whether they increased or decreased the amount of food, liquids, or breast milk offered to the ill child and if they offered special foods or liquids, including ORT; whether they sought help from a traditional health care provider (curer, midwife, family member or friend) or a modern health care provider (including doctors, public health centers or hospitals, or nurses) and whether they followed the health care advice given to them. Mothers also answered open-ended questions about the use of home remedies and/or pharmaceuticals and whether the mother bathed the child, kept the child in bed, or permitted the child to play outside while ill.

Eight practices were selected for a composite index of illness management using WHO recommendations for the home management of diarrhea current when the study tools were developed (16). Points were assigned based on the reporting of age-specific practices as outlined in Table 1; the score on the index was calculated as the simple sum of the items. For children > 3 months, the presence of at least one danger sign (the presence of blood or mucus in diarrhea, vomiting, anorexia, lethargy, inability to drink or breastfeed, and convulsions) indicated a need for medical attention from a modern health care provider. For infants 3 months, mothers were assigned a score of one if they contacted a modern health care provider regardless of the presence or absence of danger signs and zero if they failed to seek medical care from a modern health care provider or if they sought help from a traditional provider. Additionally, one point was allotted if the mother did not offer liquids or foods to their infants during an episode of diarrhea based on the WHO recommendation at the time that infants should be exclusively breastfed to 4–6 mo (17).

We assessed repeatability of the individual indicators and scores on the overall index using the kappa statistic and intra-class correlation coefficients, respectively. We further tested associations between index scores and stunting (length for age Z scores 2) and underweight (weight for age Z scores 2) at 12 and 24 months of age using logistic regression.

Maternal Academic Skills

We measured maternal academic skills in 1996–1999 using a series of academic achievement tests. We assessed general knowledge; numeracy (numbers and simple calculations); preliteracy (ability to sound letters, words, phrases); literacy (ability to read and interpret a local newspaper headline); and reading comprehension (scores on two modules from the Inter American Reading Series related to comprehension and vocabulary). All tests were administered in quiet environments. We calculated a summary measure of academic skills from the knowledge, numeracy, literacy and reading comprehension components. Individual tests exhibited high test-retest reliability (r=0.85–0.95) and the summary measure proved to be a reliable and robust estimate of global educational achievement. A detailed description of the validity and reliability of the summary measure and the individual tests can be found in Li et al (18). For analyses purposes, we categorized the summary measure of maternal academic skills according to population based tertiles with a category for missing.

Maternal Cognitive Ability

Maternal cognitive ability was measured using Raven's Progressive Matrices in a separate study conducted in the same villages in 2002–2004. The Raven's Progressive Matrices measure both eductive and reproductive ability, the two primary components of intelligence as defined by Spearman (10); thus scores on the Raven's are considered a good indicator of basic cognitive ability and the capacity of an individual for orderly thinking and perception (19, 20). The Raven's consist of a series of diagrams of increasing complexity in which a component of the diagram is missing. It is important to note that schooling acquired skills such as literacy are considered unlikely to influence test performance because the matrices measure nonverbal processing (20).

Pilot testing in the target community indicated that respondents would unlikely be able to progress past the third series thus women in the current study were administered only the first three series (12 items each). This reduced version of the test exhibited high test-retest reliability (r=0.87) and construct validity in this population. Additional details on the administration, reliability, internal consistency, and construct validity of the Raven's in this population can be found elsewhere (21). For analyses, Raven's scores were categorized according to population based tertiles with a category for missing.

Additional Covariates

Data on household socioeconomic status (SES), household size, maternal age, years of formal schooling, marital and work status were collected as part of a study-related household census in 1996. Socio-economic status was expressed as the score derived from principal components analysis from data on household characteristics and possessions; lower scores represented lower SES. Maternal age and household SES were defined categorically according to approximate population-based tertiles. The median years of schooling in this population was three; < 10% of mothers completed six or more years of schooling. We therefore classified years of schooling according to the following categories: <1 year; 1 ≤ years ≤ 3; 3 < years ≤ 6 years; > 6 years. We controlled for community of residence in all models. Maternal work and marital status were categorized dichotomously

as employed outside of the home versus not and single versus not single (married and/or cohabiting), respectively. Information on infant sex, birth weight, place of birth and details on the mode, duration and complications of delivery were collected within 24–72 hours of delivery by trained field nurses. Parity was verified from census records and medical history. Infant place of birth was coded dichotomously as having taken place in a home or at a health facility. Birth weight was dichotomized as <2500 g versus 2500 g. A summary hygiene index was created from repeated spot-check observations of household hygiene indicators. Child length was measured at 15 days and every three months to 24 months using a portable length board and every 6 months from 24–36 months using a portable stadiometer. Weight was measured at birth and every three months thereafter. Length-for-age (LAZ) and weight-for-length (WLZ) Z scores were calculated using the WHO 2006 growth standards.

Study Participants

Data on child morbidity were collected from 610 mothers. Of these, 493 mothers (n=689 children) reported at least one incident episode of child diarrhea for a total of 2152 episodes. Of 2152 incident episodes of diarrhea observed during the follow up period, illness management practices were reported for 1534 episodes (n=466 women, 655 children); the median number of interviews was 3 (interquartile range: 2, 4). Of these women, 390 were administered the academic achievement tests and had a summary measure for maternal academic skills. Three hundred and sixty seven women also completed the Raven's in 2002–04. Women with a summary measure of maternal academic skills did not differ from those without this measure with respect to maternal, household, or child-level characteristics, or IMI scores. Women with Raven's scores were approximately one year younger than those missing Raven's scores (25.5 ± 4.1 y vs. 26.5 ± 4.9 y, $p = 0.04$); no additional differences were observed. Women with information regarding years of schooling did not differ from those without for maternal, household, or child level characteristics or scores on the IMI.

Analytic Strategy

We calculated mean scores and standard errors for IMI scores by categories of maternal and infant characteristics. Adjusted differences in mean IMI scores by categories of maternal Raven's scores, years of schooling, and academic skills were estimated using a mixed effects model with random intercept and unstructured covariance matrix (PROC MIXED; SAS Institute, v9.1.3 Cary, NC, USA). These methods do not require the same number of observations on each subject or that the measurements be obtained at exactly the same time intervals between or within individuals (22), therefore all available IMI scores were used. Models were adjusted in a step-wise additive manner for maternal and infant factors that were determined a priori including maternal age, community of residence, parity, place of delivery, infant sex, infant low birth weight, maternal employment outside of the home and household SES (model 1). The ability of each of the predictors to attenuate associations while controlling for previously included covariates was then assessed (model 2). The ability of household SES and the schooling/cognitive predictors to modify potential relationships was examined using interaction models with product terms. Main effects and interaction terms were considered significant at $p<0.05$.

RESULTS

Mothers with at least one IMI score (n=466) were on average 25.8 ± 4.3 years of age at enrollment; 48% had more than 2 children and 21% worked outside of the home. The majority of mothers (55%) had 3–6 years of formal schooling. Thirty-nine percent of the 1534 diarrhea episodes were classified as mild, 33% as moderate, and 27% as severe. Seventy-three per cent were less than one week in duration. Mothers reported breastfeeding at the same or higher frequency during 73.4% of episodes and age-appropriately offering the same or additional foods and liquids to their children in 85% and 45% of episodes, respectively. ORT was offered to sick children in 18% of episodes. For 53% of diarrhea episodes the need to seek help from a modern health care provider was indicated either by the presence of danger signs or the young age of the child (< 3 months). Help was not sought in 44% of indicated episodes.

The mean score on the IMI was 3.3 ± 1.2 (out of a possible 8 points). Repeatability for individual practices in the IMI was low (kappa < 0.25) with the exception of continued breastfeeding (kappa = 0.58). Repeatability of the summary index was likewise low (ICC = 0.11); at least 3 measures would be needed to measure, within 20%, a mother's true IMI. Each unit increase in IMI scores for children 0–6 months of age was associated with a borderline significant reduction in the odds of being stunted at 12 months of age after adjusting for sex, age, number of incident episodes of diarrhea, maternal age, and SES (0.478 [95%CI: 0.225, 1.015] p = 0.06)). Each unit increase in mean IMI scores from 0–12 months of age was associated with significantly reduced odds of child underweight at 24 months (0.524 [95%CI: 0.288, 0.953]).

Mean scores on the IMI are presented according to maternal and child descriptives in Tables 2 and 3. Mean scores were significantly higher for women scoring in the highest category of maternal academic skills compared to those in the middle and lowest tertiles (Table 2). Mothers' scores were significantly higher when diarrhea episodes were severe compared to mild or when episodes persisted for more than one week (Table 3). Scores were also higher when children were younger compared to when they were older children (p < 0.001); scores did not differ by other maternal or infant characteristics (Tables 2, 3).

In adjusted, mixed effects models women scoring in the middle tertile for maternal academic skills scores scored significantly lower on the IMI compared to women scoring in the highest tertile after adjusting for sociodemographic, maternal and child factors, Raven's scores, and maternal years of schooling (−0.30 [95%CI: −0.54, −0.06] Table 4). Years of schooling modified the association between Raven's scores and the IMI (p for interaction = 0.02). For women with less than 1 year of schooling, scoring in the lowest tertile of Raven's scores was associated with scoring approximately 1 point lower on the IMI when compared to women in the highest tertile (−1.18 [95%CI: −2.20, −0.17] Table 5) in adjusted, mixed-effects models. IMI scores did not differ across categories of Raven's scores for women who had completed at least one year of formal schooling.

DISCUSSION

We examined the independent associations of maternal cognitive abilities, schooling, and academic skills, with scores on a summary index of appropriateness of illness management practices during episodes of child diarrhea. The index was developed using multiple practices related to home-based care and health-seeking (16, 17). Scores on this index were low likely because the provision of ORT, seeking appropriate health care during indicated episodes, and following the advice of health care professionals occurred in less than half of all episodes.

While studies have observed positive associations of literacy (5, 7) and duration of formal schooling with illness management and health seeking practices (3, 4), research on the independent effects of multiple academic skills generally acquired through schooling is limited. Given that quality of schooling can vary across contexts, standardized measures that quantify what is acquired in the formal schooling process may be a more appropriate exposure measure. We observed that a summary measure of maternal academic skills, measured using standardized academic achievement tests, was associated with improved management of childhood diarrhea. This finding lends support to one key pathway by which schooling may impact child health: academic skills facilitate improvements in illness management practices. Furthermore, academic skills were significantly associated with IMI scores after controlling for the length of exposure to formal schooling indicating that this measure was likely not serving as a proxy for other schooling-acquired traits such as autonomy or modernity.

We observed that lower Raven's scores were associated with poorer management of childhood diarrhea only among mothers who had not attended school. We conjecture that schooling is compensatory and served to "level the playing field" between women with higher versus lower cognitive abilities. This finding may have relevant policy implications for resource poor settings in that even low levels of schooling may substantially enhance care giving practices and related child health outcomes in certain populations. It is possible that in this context schooling increased disease-related knowledge or promoted attitudinal changes that resulted in greater self-confidence, decision-making skills, and/or increased acceptance of modern medical therapies. However, we did not measure these particular schooling related outcomes and cannot say to what extent they contributed to the observed associations.

Traditionally, a single interview reflecting the most recent illness episode has been used to assess maternal care-giving. However, multiple factors related to economic or time constraints, household size, child age, or the severity and duration of the episode may influence a mother's behavior during a particular episode of illness (1, 23) potentially introducing substantial intra-person variability in care practices. A composite index of care-giving practices obtained for multiple episodes, as opposed to the use of a single indicator or a single measurement, may reduce misclassification in risk assessment and allow for identification of behavioral tradeoffs that optimize practices within constrained settings. This study utilized a prospective approach and obtained information on care-giving and health-seeking practices across multiple episodes of diarrhea of differing severity and

duration. In this population, we observed that appropriate management of diarrhea in the first year of life was associated with reduced growth faltering at 12 and 24 months, indicating the biological validity of the index. Additionally, we observed substantial variation within mothers with respect to individual practices and scores on the composite index suggesting that indeed, multiple measures are needed to adequately capture maternal practices.

The IMI used in this analysis was developed using WHO recommendations that were current at the time of the study in 1996 (16, 17). Recommendations regarding infant feeding during illness have since been revised to include increased exclusive breastfeeding for infants   6 months. Had the IMI used the current recommendation then scores would likely have been lower. However to the extent that cognitive ability, schooling and academic skills influence adherence to recommendations, our inferences with respect to associations between these measures and IMI scores, would likely not differ had the study fallen under the auspices of the current recommendations. Although the data were collected a decade ago, the results of this analysis are relevant today. Home care of child diarrhea remains a critical care practice in developing countries where access to adequate and affordable health care is limited. Thus understanding the factors that may influence mothers' ability to deliver appropriate home-based care remains a necessary area of study (24).

We are unable to exclude the possibility that mothers with more schooling had better illness management practices in the current study because, as children, they were exposed to better health care practices which they later applied to their own children. Furthermore, we are limited in our ability to examine to what extent continued schooling beyond 6 years influences child care practices. Additionally, scores on the Raven's Progressive Matrices were obtained after measurement of the outcome variable. However Raven's scores obtained in adulthood are considered stable (19). Thus we assumed in our interpretations that individuals would have scored similarly had the RPM been administered prior to the collection of outcome data. Lastly, because illness management practices were reported, rather than observed, it is possible that underreporting of poor practices or over-reporting of good practices inflated IMI scores.

Appropriate management of childhood diarrhea in the home and timely health seeking can reduce the risk of serious complications and death (1). Understanding of factors that influence these practices is critical to the design and implementation of programs to enhance mothers' illness management and health seeking practices. We observed that mothers' academic skills were associated with enhanced care giving during diarrhea. Innate ability, as measured by Raven's scores, however was associated with improved IMI only in women who had not attended school suggesting the dominant impact of skills, attitudes, and knowledge acquired through school. Given the importance of girls schooling to myriad child health outcomes in developing countries, it is imperative that girls' enrollment in formal schooling remain a top priority in these settings. Indeed, prioritization of girls schooling could enhance progress towards reaching the Millennium Development Goal (MDG) targets related to universal primary schooling, gender equality, and child health (MDG 2, 3, and 4, respectively) in countries where current benchmarks indicate that they are off track (24).

Acknowledgments

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Table 1

Illness management practices selected to develop an age-specific illness management index (IMI) during incident episodes of child diarrhea.

Illness Management Practice	Age groups (mo)	
	<= 3	> 3
Mother offered breast milk		
■ the same or more	1	1
■ less or none if child still breastfed	0	0
Mother offered ORT		
■ yes	1	1
■ no	0	0
Mother offered liquids		
■ the same or more	0	1
■ less or none	1	0
Mother offered foods		
■ the same or more	0	1
■ no	1	0
Mother withdrew foods, liquids, breast milk from child's diet		
■ no/not applicable	1	1
■ yes	0	0
Mother consulted modern health care professional if:		
● at least one danger sign present[3] or	yes=1	yes=1
● child was less than 3 mo	no=0	no=0
Mother followed advice of health care practitioner		
■ all or some	1	1
■ none, or not available	0	0
Mother consulted traditional practitioner if:	yes=0	yes=0
● at least one danger sign present[3] or	no=1	no=1
● child was less than 3 mo		
Total Points Possible on the IMI	8	8

[1] Special foods included thin maize porridges (atoles), locally prepared foods.

[2] Vomiting, fever, blood or mucus in stools, convulsions, lethargy, anorexia, and refusal to breastfeed

Table 2

Mean scores and standard deviations on the illness management index (IMI) by categories of baseline maternal and infant characteristics for 466 rural Guatemalan women participating in a follow-up study in 1996–1999.

Baseline Characteristic	N	Mean ± SD	P value[1]
Scores on the Raven's Progressive Matrices			
missing	99	3.4 ± 1.2	
< 13	104	3.2 ± 1.1	
13–17	165	3.2 ± 1.2	
> 17	98	3.4 ± 1.2	0.35
Formal schooling, y			
missing	6	3.7 ± 1.8	
< 1	85	3.3 ± 1.2	
1 – < 3	127	3.1 ± 1.1	
3–6	197	3.3 ± 1.2	
>6	51	3.4 ± 1.3	0.20
Scores on a summary measure of maternal cognitive skills			
missing	76	3.3 ± 1.3	
<50.2	133	3.2 ± 1.2	
50.2 – 76.1	128	3.1 ± 1.1	
> 76.1	129	3.5 ± 1.2	0.02
Household socioeconomic status score			
missing	45	3.0 ± 1.3	
−3.0–(−0.55)	139	3.2 ± 1.1	
−0.55–0.36	143	3.3 ± 1.2	
0.36–3.0	139	3.4 ± 1.2	0.05
Maternal age at enrollment, y			
missing	5	3.4 ± 1.8	
<23	150	3.4 ± 1.2	
23–28	159	3.1 ± 1.2	
> 28	152	3.3 ± 1.2	0.37
Number of children in household at enrollment			
missing	33	3.0 ± 1.4	
<= 2	225	3.4 ± 1.2	
> 2	208	3.2 ± 1.2	0.22
Household mean scores for a summary hygiene index			
missing	3	3.3 ± 2.5	
0 – < 6	148	3.2 ± 1.0	
6–8	159	3.2 ± 1.3	
>8–15	156	3.4 ± 1.1	0.33
Mother works outside of home			
no	256	3.4 ± 1.2	

Baseline Characteristic	N	Mean ± SD	P value[1]
yes	85	3.4 ± 1.1	
missing	125	3.0 ± 1.2	0.53
Mother's marital status			
married/partnered	328	3.4 ± 1.2	
single	12	3.3 ± 0.7	
missing	126	3.0 ± 1.2	0.74
Infant Sex			
Male	343	3.2 ± 1.3	
Female	288	3.1 ± 1.3	0.62

[1]From ANOVA

Table 3

Distribution of illness management index (IMI) scores by severity and duration of episodes and by child age and gender for 1534 episodes of diarrhea among 655 children in rural Guatemala participating in a longitudinal study in 1996–1999.

	Categories of Illness Management Index Scores			P value[1]
	0–2	**3–5**	**5–8**	
Overall IMI scores	40.3	48.6	11.1	
Severity of Episode				
mild	57.2	38.4	4.4	
moderate	31.2	55.6	13.1	
severe	27.8	54.3	17.9	<0.01
Duration of Episode				
<7 days	45.1	46.4	8.5	
7–14 days	26.9	55.9	17.1	
> 14 days	29.4	51.5	19.1	<0.01
Child Age				
> 3 mo	0.0	90.7	9.3	
3–6 mo	40.3	49.6	10.1	
6–12 mo	31.6	49.3	19.1	
> 12 mo	45.7	46.0	8.4	<0.01
Child Gender				
female	39.6	49.6	10.8	
male	40.8	47.8	11.4	0.78

[1]Estimated from chi square analyses

Table 4

Adjusted differences and 95% confidence intervals for mean scores on the illness management index (IMI) by categories of maternal cognitive ability, years of schooling and maternal cognitive skills for 466 rural Guatemalan women participating in a longitudinal study in 1996–1999[1].

	Model 1[2]	Model 2
Raven's Progressive Matrices Score		
Missing	−0.05 (−0.33, 0.23)	0.00 (−0.29, 0.30)
< 13	−0.19 (−0.46, 0.09)	−0.15 (−0.44, 0.14)
13–17	−0.21 (−0.47, 0.04)	−0.18 (−0.45, 0.08)
> 17	Referent	Referent
Years of formal schooling		
Missing	0.32 (−0.53, 1.16)	0.40 (−0.46, 1.27)
< 1	−0.23 (−0.59, 0.14)	−0.18 (−0.56, 0.19)
1 – < 3	−0.32 (−0.63, 0.00)	−0.30 (−0.62, 0.02)
3–6	−0.14 (−0.45, 0.17)	−0.14 (−0.45, 0.16)
>6	Referent	Referent
Scores on the summary measure of maternal academic skills		
Missing	−0.12 (−0.39, 0.15)	−0.11 (−0.40, 0.18)
< 50.2	−0.28 (−0.53, −0.02)	−0.24 (−0.54, 0.07)
50.2–76.1	−0.31 (−0.54, −0.07)	−0.30 (−0.54, −0.06)
> 76.1	Referent	Referent

[1] Adjusted mean differences estimated from mixed effects models with random intercept; 95% confidence limits were calculated using robust variance estimates.

[2] **Model 1** adjusted for maternal age, work and marital status, household SES score, hygiene index score, community of residence, infant sex and age, and duration and severity of diarrheal episode. **Model 2** adjusted for all variables included in model 1 and Raven's scores, years of schooling, and maternal academic skills scores.

Table 5

Adjusted differences and 95% confidence intervals for mean scores on the illness management index (IMI) by scores on the Raven's Progressive Matrices, stratified by years of schooling for 466 rural Guatemalan women participating in a longitudinal study between 1996–1999.[1]

Scores on the Raven's Progressive Matrices	Years of Schooling		
	< 1 year (n=85)	1–6 years (n=324)	>6 years (n=51)
Missing	−1.24 (−2.26, −0.21)	0.33 (−0.12, 0.78)	0.11 (−0.26, 0.48)
< 13	−1.18 (−2.20, −0.17)	0.13 (−0.25, 0.50)	−0.22 (−0.65, 0.21)
13 – 17	−0.90 (−1.91, 0.10)	0.11 (−0.23, 0.45)	−0.35 (−0.71, 0.01)
> 17	Referent	Referent	Referent

[1]Adjusted mean differences estimated from mixed effects models with random intercept; 95% confidence limits were calculated using robust variance estimates.

[2]Model adjusted for maternal age, work, marital status, maternal academic skills scores, household SES score, hygiene index score, community of residence, infant sex and age, and duration and severity of diarrheal episode.