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Development of the Health Literacy Assessment Scale for Adolescents (HAS-A)

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Abstract

Background—Health literacy has been found to be a crucial component of successful communication and navigation in health care. Various tools have been developed to measure health literacy skills, but few have been developed specifically for adolescents, and most require in-person administration. This study sought to develop a self-report health literacy scale for adolescents to assess four key health literacy domains: the ability to obtain, communicate, understand, and process health information.

Methods—We collected data from 272 youth aged 12–19 recruited from a pediatrics clinic (37%) and the community (63%). We administered the Rapid Estimate of Adolescent Literacy in Medicine-Teen, Newest Vital Sign, and three surveys, and used factor analysis to identify scale items.

Results—Using multiple health literacy assessments, it was clear that many teens struggle with low health literacy skills. When identifying items that can be used as self-report items in future research, factor analysis identified three subscales; a 5-item *communication* scale (alpha = 0.77), a 4-item *confusion* scale (alpha = 0.73), and a 6-item *functional health literacy* scale (alpha = 0.76). The scales performed reasonably well when compared with validation items.

Conclusions—Self-report items can be used to assess health literacy skills for adolescents when in-person administration is not possible or feasible. Such items will allow for greater study of how health literacy impacts communication in not only health care settings, but for all levels of health

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Contributors Dr Manganello led the study, analysis, and manuscript writing. Dr DeVellis, Dr Davis, and Dr Schottler-Thal all contributed to method design and manuscript preparation. Dr DeVellis also assisted with analysis. All authors contributed to interpretation of findings.

Conflicts of interest None.

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communication. The tool will also allow researchers to better understand how adolescent health literacy is related to a variety of health outcomes. Further testing of these scales with different populations is warranted.

Keywords

Adolescent; Attitudes; Communication; Health knowledge; Health literacy; Practice; Psychometrics; Validation studies; Young adult

Introduction

Health literacy research has grown over the past decade. The existing body of work has documented a strong relationship between health literacy and health outcomes for adults,[1] and a growing number of studies have examined health literacy for parents, finding that low health literacy among parents leads to worse child health outcomes.[2] In particular, research has found that health literacy, including numeracy, can play an important role for communication in health care settings[3–6]; people with lower health literacy skills often report greater issues with provider communication.

However, health literacy research with adolescents is limited due in part to a lack of measurement tools appropriate for this population.[7] This is concerning as adolescents are at an age where they are becoming more autonomous, making their own decisions about health, and becoming increasingly involved with their health care.[8] The Adolescent Health Literacy Framework[7] presents a model for the study of health literacy and adolescents. Research based on the model can help the field better understand predictors for and outcomes of low health literacy for adolescents. Yet, few studies have explored these relationships, including how health literacy impacts adolescent health communication; a likely cause is limited measurement options.

Education or a combination of measures of socioeconomic status have been used as a proxy for health literacy in research[9]; however, studies have shown that health literacy acts as a unique measure separate from race, education, and income.[10] Health literacy tools used with adolescents include the Rapid Estimate of Adolescent Literacy in Medicine (REALM-Teen),[11–13] the Test of Functional Health Literacy in Adults (TOFHLA),[14–21] and the Newest Vital Sign (NVS).[22–26] However, these instruments assess very specific skills that are one part of health literacy, such as reading ability, reading comprehension, and numeracy. They are also not self-administered, making them difficult to use for large-survey samples.

Skills-based assessments using stimuli with follow-up questions, such as the Health Literacy Skills Instrument,[27,28] and a tool specifically designed for use with adolescents[29] provide a unique way to more fully measure health literacy skills, but the time required to complete these tools may make them difficult to incorporate into surveys.

Others have developed self-report questions, such as the Brief Health Literacy Screen (BHLS), a series of three questions developed by Chew *et al.*[30] These items have been utilized by others,[31–37] and a Single Item Screener using only one of the questions has even

been validated for use.[38] However, these studies all focused on adults. One other recently developed self-report scale was validated with young adults aged 18–25, but was not compared with any of the standard existing health literacy assessment tools, and was not evaluated for use with adolescents.[39]

Other self-report questions and scales have been used with adolescents, but all have limitations.[40–42] One study developed original questions but did not compare them with existing health literacy assessments[40]; another used these same items.[42] A third surveyed only low-income and publicly insured adolescents, and excluded participants with no health care in the past 12 months; they also did not compare the resulting scale with existing 'gold standard' measurement tools.[41]

Reports on health literacy measurement have indicated a number of limitations in existing tools, such as the lack of a comprehensive measure of multiple aspects of the construct,[43,44] a focus on individual skills,[44] and variations in the rigor of instrument validation as well as limited evaluation with diverse populations.[43] In order to advance knowledge of health literacy for adolescents, it is imperative to establish a set of self-report questions that can be incorporated into self-administered surveys, especially large-scale surveys that enable population-based research.

Methods

The study used a non-experimental, cross-sectional design. Data were collected via two assessment tools (REALM-Teen and NVS) and three paper surveys.

Sample

We included data in our analysis from 272 English-speaking participants aged 12–19 in upstate New York. Youth were recruited through a pediatrics clinic at a teaching hospital (37%) and from the community (63%) through organizations and schools, flyers, and word-of-mouth. Participants were provided with $20 cash for their participation.

Health literacy assessment

We used two tools to assess health literacy. One was the REALM-Teen, used because of its ease of administration, prior validation with adolescents, good correlation with other tests,[11,45] and because it has been used as a gold standard for assessing other health literacy-related self-report questions.[36] It is a word recognition test,[11] where respondents are asked to read a list of 66 words to an interviewer. The tool includes words like 'adolescent', 'nutrition', and 'eye', and participants receive a point for each word pronounced correctly. The second tool was the NVS, which has been validated with adolescent populations.[25] Respondents were given a sample nutrition label and asked a series of six questions by an interviewer to assess both reading and numeracy skills.

Health literacy scale items

Survey 1 included 62 scale items. We used the following health literacy definition to guide scale development: 'the degree to which individuals can *obtain*, *process*, *understand*, and

communicate about health-related information needed to make informed health decisions'.[46] We developed scale items by reviewing existing items from the literature (for example, the screening items developed by Chew *et al.*[30]), analyzing pilot data with scale items from a study with undergraduates,[47] and creating new items as needed. The first author developed an initial list of approximately 135 questions addressing all of the four health literacy constructs (obtain, understand, communicate, and process) guided by a survey map. In order to establish content validity for the scale, which refers to the extent the items accurately reflect the domain(s) specified in the definition of the construct, this list of candidate questions was reviewed by a health literacy expert (author 3) and pediatrician (author 4). This review and further discussion by the team led to a final set of 62 items (a minimum of 10 per construct): 10 obtain, 26 understand, 13 communicate, and 13 process items. We worded all questions as frequency questions with the following response choices: *Always*, *Usually*, *Sometimes*, *Rarely*, and *Never*. Thus, wording for items adapted from other sources was adjusted to conform to this format. In addition, we used black and white clip art images inserted throughout the survey to help give the survey a 'youth-friendly' feel. A summary of items is presented in Table 1.

Demographics

Survey 2 asked participants to provide information concerning sociodemographic characteristics. We asked about age, sex, race, ethnicity, US nativity and primary language, employment, and maternal and paternal education. We also asked several school-related questions, including current grade in school, whether they received special education services or reduced/free lunches, school grades, and whether they ever took a health education class. Survey 2 also included a series of questions about health care utilization and information seeking, as well as access to and utilization of technology. These items were not used in the development or validation of the Health Literacy Assessment Scale for Adolescents (HAS-A) and are not described further unless identified in Table 1 as validation items.

Validation questions

We planned to use the REALM-Teen and NVS as validation instruments since others have also relied on commonly used health literacy tools to validate scale items.[30,36,38,48] We also included questions in survey 2 we planned to use to help with validation. However, once the study began, we were concerned this would not be sufficient to validate scales that might arise for all four domains. To address this limitation, we developed and incorporated survey 2b with 20 additional items specifically to be used for validation. These items were selected based on their conceptual relevance to the domains and while some were original, others were culled from existing scales and tools, such as the Ask, Understand, Remember Assessment (AURA)[49] which measures patient communication self-efficacy (Table 1). As we added this survey later in the study, 156 participants completed it.

Data collection

We conducted both individual and group data collection sessions. For individual sessions, the respondent self-administered survey 1, followed by the REALM-Teen and NVS administered by an interviewer, followed by surveys 2 and 3, which were self-administered.

Non-individual data collection occurred (a) when participants chose to participate with companions (e.g. siblings or close friends) or (b) when we collected data at organization (e.g. school) sites. In these latter cases, participants completed the self-administered surveys individually in a room in which others were also completing the surveys. Then, each participant was brought into a private area to complete the REALM-Teen. Finally, the NVS was administered to the group as a whole, with a research staff member reading each question and the youth writing their answers down instead of saying them out loud.

Analysis

Responses to assessments and survey questions were entered into an Excel database and analyzed using STATA 13.[50] Descriptive statistics such as percentages and averages were calculated for demographic characteristics. Scores for the REALM-Teen and NVS were calculated according to the standard instructions.

We analyzed scale questions using exploratory factor analysis (EFA, common factors with maximum likelihood estimation and promax oblique rotation). At the earliest stages of scale development, EFA is preferred to confirmatory factor analysis because it imposes fewer *a priori* constraints on the solution and thus is useful for identifying empirically based departures from the anticipated factor structure.[51] We used eigenvalues and Horn's parallel analysis[52] to determine how many factors to retain.

We evaluated internal consistency reliability using Cronbach's alpha method used in other health literacy studies.[53] To assess criterion (*predictive*) validity, we assessed correlation with the measurement of a 'gold standard'.[54] To evaluate construct validity, we compared scale scores with additional validation items (other than the REALM-Teen and NVS) identified in Table 1.[54,55] We used Spearman's rank correlation coefficient or Pearson's coefficient (for scales scored as interval variables) to compare the corresponding validation items.

The study was approved by the University at Albany and Albany Medical Center institutional review boards. We obtained written informed consent or assent from all participants and written parental consent for participants under the age of 18.

Results

Table 2 presents information regarding the sample of adolescents. The sample was very diverse, with a mix of race/ethnicity, grades in school, and parental education levels reported. The average age of the sample was 15.6 (range 12–19); 63% of the sample was female and 93% was born in the USA. When asked about special education, 12% said they had received services, while 45% reported received a free or reduced lunch. Almost all students (93%) had taken a health education class in school. Only 4% had not seen a doctor in the past year; 50% reported one to two visits, while 32% said three to five visits, and 14% reported six or more visits.

We hypothesized the HAS-A would measure four unique health literacy domains. After running the first factor analysis with all 62 items, five prominent factors emerged with

eigenvalues of 2 or more that accounted for 37% of the total variance. We ran a second analysis with all items identified in these first five factors that had a factor loading of 0.3 or higher (regardless of whether they cross-loaded or not). This resulted in three main factors with eigenvalues of 2 (rounded up from 1.8) or greater, which was supported by the parallel analysis. These three factors accounted for 41% of the variance. We titled the three factors as *Scale 1: Communicating health information* (eigenvalue = 7.3), *Scale 2: Confusion about health information* (eigenvalue = 3.0), and *Scale 3: Understanding health information* (eigenvalue = 1.8), and dropped any items whose inclusion did not increase coefficient alpha. Items associated with each factor and scale scoring details are listed in Table 3.

Scale 1 included four items from the *communication* domain and one item from the *understand* domain as noted; however, this item could easily considered a *communication* item given its relationship to oral communication. Three of the four items in Scale 2 were from the *understand* domain while one was from the *process* domain (as noted), and all related to confusion about health information. All items in Scale 3 were from the *understand* domain.

Scale 1, with five items, had scores ranging from 4 to 20 (mean and median = 15). The alpha was 0.77 suggesting a reasonable level of internal consistency. Scale 2, having four items, had scores ranging from 0 to 15 (mean and median = 5), and an alpha of 0.73, again suggesting the internal consistency of the scale was reasonable. Scale 3 had six items with scores ranging from 0 to 21 (mean and median = 8), and another strong alpha of 0.76. Factor 1 had a −0.50 correlation with Factor 2, Factor 2 had a 0.47 correlation with Factor 3, and Factors 1 and 3 had a correlation coefficient of −0.42.

To determine scale scoring, we examined the frequency of responses for each set of scale items. Based on how responses of *Always* (4), *Often* (3), *Sometimes* (2), *Rarely* (1), and *Never* (0) were coded, for Scale 1, a higher score meant higher health literacy. We considered anyone with a score less than 15 as having low health literacy. This indicated that the person answered *Sometimes* to at least one of the items. Someone with a score of 15 or higher would have answered at least *Often* to all five responses. For Scales 2 and 3, a lower score meant higher health literacy. Thus, we considered anyone with a score of 8 or higher for Scale 2, and 12 or higher for Scale 3, to have low health literacy. This would mean someone with high health literacy would have answered *Rarely* or *Never* to all items.

When validating the scales, we used the communication items for the *communication* scale, and the understand items for the *confusion* and *functional health literacy* scales. To assess criterion validity, we examined the correlation with the ‘gold standard’, and to assess construct validity, we assessed the correlation with other items related to the domains. Results are shown in Table 3. The *communication* scale correlated substantially with its gold standard measure, AURA ($r = 0.69$, $P < 0.0001$). The AURA was correlated with the other scales as well, which makes sense since there are two understand-oriented questions in the AURA (*confusion* scale $r = -0.50$; *understand* scale $r = -0.42$), but the correlation was not as strong as with the *communication* scale. The *confusion* and *functional health literacy* scales had more modest correlations with their gold standard assessments, but they had higher correlations than the *communication* scale did. Since the REALM-Teen is a word

recognition test, it is not necessarily measuring the same skills as the resulting scales. The NVS assesses reading comprehension and numeracy, so is more closely aligned with the scale skills as indicated by the slightly better correlation coefficients. When compared with other validation items (labels such as C1 are used to match the item in Table 4 to the question in Table 1 for reference), the scales performed fairly well.

Table 4 presents information about the measurement of health literacy in our sample. Using recommended scoring procedures,[22] the NVS identified about 12% as having 'limited literacy' and another 37% with 'possible limited literacy'. Using the REALM-Teen scoring instructions,[11] we classified respondents to a specific grade level for reading. We then scored them as having high or low health literacy depending on how their REALM-Teen reading grade level compared to their actual grade level in school. This led to 34% of the sample being identified as having low health literacy. Comparable to the NVS and REALM-Teen, the scales identified anywhere from 18 to 37% as having low health literacy depending on the scale.

When comparing all five health literacy scores (REALM-Teen, NVS, Scale 1, Scale 2, and Scale 3) by demographics, there were no significant difference in scores by sex or age. There was a significant difference by race/ethnicity for some scales; white teens were much more likely to score higher on the REALM-Teen, NVS, and Scale 2 than Black or Hispanic teens ($P < 0.0001$), and somewhat likely for Scale 3 ($P = 0.002$). Only the REALM-Teen scores showed a difference for teens who spoke a language other than English at home ($P = 0.001$), and only the REALM-Teen and NVS scores were highly correlated with father education ($P < 0.00101$) and mother education ($P < 0.0001$). Teens who reported receiving free or reduced lunch were much more likely to score lower on the REALM-Teen and NVS ($P < 0.0001$), as well as for Scale 2 ($P = 0.003$). Teens who reported receiving special education services were much more likely to have lower health literacy but only according to the REALM-Teen and NVS scores ($P < 0.0001$). Finally, teens with lower grades were significantly more likely to have low health literacy with the REALM-Teen and NVS ($P < 0.0001$), but there was no difference for Scale 1 ($P = 0.161$), and moderate differences for Scales 2 ($P = 0.003$) and 3 ($P = 0.005$).

Discussion

The HAS-A provides a significant advancement in the field of health literacy, as study results suggest the set of questions included in the HAS-A can be used as a self-report measure of certain health literacy constructs with adolescent populations, filling an important and previously unmet measurement need.

Of interest is that the *communication* scale was not related to sociodemographics. We hypothesize that it may be tapping into a domain that is less dependent on individual characteristics; someone may be able to read quite well but feel less comfortable when communicating with others, especially providers. It may also be that adolescents are more likely to report negative responses because these items may feel less like a self-evaluation since the items are also focused on providers (i.e. reporting 'Rarely' for 'How often does your doctor seem to understand you when you answer a question he or she asks?'). It is also

likely that responses to communication items would be influenced by provider traits. This points to the significance of ensuring that adolescent health providers are encouraged to use approaches such as the Teach-Back method (having the patient explain the information back to the provider[56]) and other recommended practices (such as using pictures or slowing down while explaining information[56]) to ensure adolescent patients are able to understand the information provided to them.[56]

Also of interest is that no *obtain* items and only one *process* item made it into the final version of the scale. Experience suggests that researchers often conceptualize broad constructs (such as health literacy) with greater complexity and differentiation than do members of the public. In the present instance, for example, although obtaining information was initially conceptualized as a discrete subdomain of health literacy, from the perspective of the adolescents completing the instrument, the analysis did not support that notion. It has also been reported that people typically overestimate their ability to search for health information, especially with respect to electronic sources,[57–60] which has become more relevant as many youth use the Internet to search for health information.[61,62] It is possible that a more skills-based assessment is needed to assess health information seeking skills.[58]

The study is not without limitations. While a convenience sample limits generalizability to all adolescents, it is considered a reasonable approach for scale development as long as the sample is similar to the population of interest[63] and has been used in prior studies of scale development.[51] We were also unable to assess test–retest reliability given the lack of time in this pilot study for multiple data assessments. Certain subgroups, such as rural teens, may be under-represented. However, the sample was racially and ethnically diverse. Also, only English-speaking patients were able to participate in the study. This is a significant limitation given that those with limited English speaking skills are likely at risk for having low health literacy.[64] However, it is expected that creating a self-report question scale will allow for easy translation into other languages to enable future testing and validation of the scale with non-English-speaking youth. Importantly, the resulting scales do not fully assess all aspects of a complex definition of health literacy, which is a limitation of many health literacy measurement tools.[64] It is important that researchers utilizing measurement tools consider which specific skills related to health literacy they are interested in measuring and select the most appropriate tools. Another issue is that this scale does not necessarily measure the health literacy environment, which is a significant component of health literacy,[65] although it is possible it is somewhat captured by items asking about health providers. Finally, we were unable to fully track response rates.

Despite these limitations, our results are of significant importance to researchers engaged in the study of adolescent health. Study results indicate that the HAS-A is a valid tool that can be used to assess health literacy in adolescent populations. While there are some concerns that self-report questions may not be a reliable measure of health literacy,[29] the use of validated self-report items will greatly expand the ability to further investigate critical issues of health literacy for adolescents. Given that our multiple measurements imply that health literacy skills are low for many adolescents, it is important to advance the field. There have been a few adolescent health literacy studies to date exploring the relationship between health literacy and health behaviors or outcomes,[10,13,15,20,21,23] and further research is

needed to evaluate how health literacy impacts youth. Inclusion of the HAS-A on youth surveys will allow for more comprehensive data to be collected, and can also be used for the evaluation of interventions to enhance health literacy skills for adolescents.

Using the HAS-A to evaluate health literacy among adolescents in the aggregate in medical and/or school settings could provide helpful information to guide development of more effective health promotion messages and health care instructions. Individual testing of patients in medical settings is no longer recommended; current recommendations suggest taking a 'universal precautions' approach by assuming that patients have 'difficulty comprehending health information and accessing health service'.[56] For example, the Health Literate Care Model guides organizations to use a 'universal precautions' and utilize practices that ensure understanding among patients, such as using the Teach-Back method, pictures, and medication reviews.[66]

As with all newly developed scales, future research should gather additional information about the validity of the instrument and determine the conditions (e.g. populations and settings) across which its performance can be generalized. Additional work can also determine the administration time, and if a shortened version is feasible. Ultimately, work that enhances health literacy measurement for adolescents will continue to play a significant role in providing important methodological advancements for the study of adolescent health.

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Table 1

Overview of scale items along with their associated validation items.

Domain	# Items	Source*	Example	Validation items+
Obtain (10 items): Knowing where and how to get health information from various sources including the Internet	3	48	When you want to get health information from a doctor, how often are you able to get it?	Mother and father education (survey 2)†
	2	69	When your doctor tells you about an illness or medical condition you have, like strep throat or diabetes, you are able to get any information you want to get about it.	Family member who is health provider (survey 2)† Primary sources of health information (survey 2)†
	1	70	When you get health information from the Internet: how often can you find information you are looking for?	HINTS: Overall, how confident are you that you could get advice or information about health or medical topics if you needed it? (survey 2b)
	4	Original	How often have you tried to get health information but could not get it?	Two of four HINTS items about effort and frustration for recent search for health information (survey 2b) One BIAS item: The last time you needed health information, you did not know how to get it (survey 2b)[67] One CAHPS item: I am able to get any questions I have answered when I go to the doctor (survey 2b)[68] If you want to know more about your health after seeing a doctor, you try to find information on your own (survey 2b)‡
Understand (26 items): Functional literacy, including reading ability, numeracy, and science literacy	4	69	When reading brochures or hand-outs about health issues, how often do you: see words and phrases that you have never seen before?	REALM-Teen: 'gold standard' NVS: 'gold standard'
	2	30	How often do you have someone help you read any written information you get from your doctor?	AURA: Two items about understanding (survey 2b)
	1	72	How often are you confused by health information that has a lot of numbers and statistics?	Grades (survey 2)†
	1	73	When people tell you the chance of something happening, how often do you prefer that they use words (e.g. 'it rarely happens') instead of numbers (e.g. 'there's a 1% chance')?	A label on a bottle of medication says: 'may impair ability to operate heavy machinery.' Does this mean you can drive a car while taking this medication? (U1/survey 2)‡
	1	70	When you get health information from the Internet, how often: do you understand the information you find?	Which of the following numbers represents the biggest risk of getting a disease? with numeric response choices (U2/survey 2) (HINTS)
	17	Original	How often do you get confused when your doctor tells you about possible side effects from a medicine or treatment?	Rothman item: Question requiring respondent to do math related to a juice label (U3/survey 2b)[71] One of four HINTS items about understanding information from recent search for health information (U4/survey 2b)
Communicate (13 items): Providing information written or orally and ability/comfort level with asking questions	1	69	When your doctor tells you about an illness or medical condition you have, like strep throat or diabetes, you are able to easily explain it to someone else.	AURA score (survey 2b): 'gold standard'[49] I am able to ask my doctor for written information about any health topic we discuss (C1/survey 2)‡

Domain	# Items	Source*	Example	Validation items+
	2	48	When you talk to people other than your doctor about health issues, how often: are you able to clearly explain your thoughts or questions?	I am usually the one who asks the doctor questions even if someone else is with me at my appointment (C2/survey 2b)‡
	1	30	How often are you confident filling out medical forms by yourself?	When you bring a form to your doctor that they need to fill out for you, you can easily figure out what part you have to fill out and what part your doctor has to fill out (C3/survey 2b)‡
	9	Original	When you get information on your own about a health issue, you: can easily explain the information to someone else.	
Process (13 items): Ability to use information to make decisions, evaluate and analyze information, and assess credibility of information/ media literacy	5	69	When you get information on your own about a health issue, you … check to see if the information is true.	NVS: 'gold standard'
	2	48	How often do you get confused because you find different information about the same health topic?	It is important to see my doctor every year even if I do not get sick (survey 2)‡
	1	70	When you get health information from the Internet, how often: do you feel confident you can use the information to make decisions about your health?	You can usually figure out what to do to be healthy on your own (survey 2b)‡ One AHRQ item: the last time you went to the doctor, you knew what you needed to do for your health when you left (survey 2b)[56]
	5	Original	When you talk to people other than your doctor about health issues, how often can you figure out if the information you get is true?	One Norman and Skinner item adapted: when you get health information from a person or place other than your doctor, you can tell the difference between high quality and low quality information (survey 2b) One of four HINTS items about assessing quality of information for recent search for health information (survey 2b)

*The source for the main idea of the question is listed even though some items may have been adapted from the original source.

†These items, while not a direct measure of that domain, were ones we felt captured conceptually similar constructs and thus should correlate with the domain.

‡Although these are original items and thus have not been previously validated, they were constructed to directly address the intended content of each domain. Therefore, we reasoned that if our scale items validly reflected the domains, they would correlate with these statements directly expressing what each domain was about.

HINTS: Health Information National Trends Survey; BIAS: Barriers to Information Access Scale; CAHPS: Consumer Assessment of Healthcare Providers and Systems; AHRQ: Agency for Healthcare Research and Quality.

Table 2

Demographic characteristics for a sample of adolescents (n = 272).

Variable	Total
Race/ethnicity (%)	
White (non-Hispanic)	110 (41)
Black (non-Hispanic)	80 (30)
Other (non-Hispanic)	31 (11)
Hispanic	50 (18)
Language other than English spoken at home	31 (11)
Father education (%)	
High school or less	67 (26)
Some college/college grad	100 (39)
Graduate work	29 (11)
Other/do not know	60 (23)
Mother education (%)	
High school or less	15 (19)
Some college/college grad	136 (51)
Graduate work	35 (13)
Other/do not know	45 (17)
Grades in school (%)	
Mostly As	104 (42)
Mostly Bs	93 (38)
Mostly Cs or lower	50 (20)
Health status (%)	
Good/fair/poor	86 (32)
Excellent/very good	186 (68)

Table 3

HAS-A results and correlation with validation items (n= 272)[*,†].

Scale	Items	Factor 1				Factors 2 and 3						
		AURA	**C1**	**C2**	**C3**	**RLM**	**NVS**	**GPA**	**U1**	**U2**	**U3**	**U4**
1. Communication: Oral communication with provider and ability/comfort level with asking questions Possible score = 0–20 Higher score = better interpersonal communication	How often is it easy for you to ask your doctor questions about your health? How often does your doctor understand what you mean when you ask him or her a question about your health? How often can you easily describe a health problem you have to your doctor? How often does your doctor seem to understand you when you answer a question he or she asks? How often do you understand the answers your doctor gives to your questions? (understand)	0.69	0.46	0.56	0.32	0.08	0.08	−0.02	0.16	0.13	−0.12	−0.35
2. Confusion Possible score = 0–16 Higher score = more confusion	How often do you get confused because you find different information about the same health topic? (process) How often do you get confused when your doctor tells you about taking a medicine? How often do you get confused when your doctor tells you about possible side effects from a medicine or treatment? How often do you get confused when your doctor tells you about test results, like results of an X-ray?	−0.51	−0.33	−0.21	−0.12	−0.21	−0.19	0.17	−0.16	−0.23	−0.16	0.45
3. Functional health literacy (including reading ability and numeracy) Possible score = 0–20 Higher score = lower ability to read health information and understand numbers	How often do you get confused when reading instructions for medicine? How often do you have problems learning about an illness or health topic because of difficulty understanding the written information you get? How often do you think the forms you complete at your doctor's office are confusing? How often are you confused by health information that has a lot of numbers and statistics? When you talk to people other than your doctor about health issues, how often are you confused by what they tell you? When reading brochures or hand-outs about health issues, how often do you need someone to help you read them?	−0.42	−0.25	−0.21	−0.32	−0.19	−0.26	0.19	−0.16	−0.21	−0.04	0.49

[*] Scale item response choices were: never (0), rarely (1), sometimes (2), usually (3), and always (4). Scale scores were created by summing the responses for scale items.

[†] Correlation coefficients were calculated using Spearman's rank to compare the scale score with dichotomous variables, and Pearson's for all other variables.

RLM: Realm-Teen; GPA: grade point average.

Table 4

Results of three health literacy assessment tools for a sample of adolescents (n = 272).

Assessment tool	Scoring detail	Results
REALM-Teen (%)		
Tenth grade and above	63–66	149 (55)
Eighth–ninth grade	59–62	50 (18)
Sixth–seventh grade	45–58	56 (21)
Fourth–fifth grade	38–44	7 (3)
Third grade and below	0–37	10 (4)
REALM-Teen recoded (%)		
High health literacy		172 (66)
Low health literacy		90 (34)
NVS (%)		
Adequate literacy	4–6	140 (51)
Possible limited literacy	2–3	99 (37)
Limited literacy	0–1	32 (12)
HAS-A (%)		
Scale 1: communication		
High health literacy	15–20	169 (63)
Low health literacy	0–14	101 (37)
Scale 2: confusion (%)		
High health literacy	0–7	211 (79)
Low health literacy	8–16	57 (21)
Scale 3: functional health literacy (%)		
High health literacy	0–11	216 (82)
Low health literacy	12–24	46 (18)