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A Comparison of Health Literacy Measurement Tools for a Sample of College Students

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A comparison of health literacy measurement tools for a sample of college students.

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ABSTRACT

PURPOSE: Different measurement tools can be used to measure the health literacy of college students, and each measure different aspects of health literacy. The purpose of this thesis is to understand how health literacy assessments vary. Identifying strengths and weaknesses of the different tools may lead to improved studies of the predictors and outcomes of health literacy in college students.

METHOD: The data were collected from college students attending a public university in the Northeast region of the United States. A total of 249 participants were recruited by class survey administration and flyer recruitments. With the exception of the Single Item Health Literacy Screening (SILS) completed by all 249 participants, 122 participants completed the other three health literacy assessments. These assessments included: Rapid Estimate of Adolescent Literacy in Medicine (REALM-Teen), Newest Vital Sign (NVS), Short Test of Functional Health Literacy in Adults (S-TOFHLA).

RESULTS: There were variations across the measurement tool scores. All students had high literacy scores for the S-TOFHLA. However, some had low health literacy scores for the SILS (20%), REALM-Teen (17%) and NVS (13%). After multivariate analysis, race (white vs non-white (OR= .09, 95% CI = .02, .49), language spoken at home (English vs. other; OR= .07, 95% CI = .02, .35), and father's level of education (OR =5.44, 95% CI = 1.19, 24.79) were significant predictors of low health literacy with either NVS or REALM.

CONCLUSION: The four measurement tools (NVS, S-TOFHLA, REALM-Teen & SILS) have varying levels of sensitivity. Some students who had high literacy scores using some measurement tools were identified as having low health literacy with other tools. Researchers and practitioners should consider which tool is the most appropriate depending on the particular circumstance.

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INTRODUCTION

College students are at an important transition stage in their lives where they have become more independent and typically have less parental supervision. Whether they live at home or on–campus, they find themselves in a new environment where they encounter new information, challenges, and stressors that can potentially strengthen or weaken positive health behaviors (Rosario et al., 2017). Evaluating and improving students' health literacy skills may not only enable them to obtain, understand, and use health information to improve their health (Mas, Jacobson & Dong, 2014)

Health literacy is the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions (Ratzan & Parker, 2000). There are three levels of health literacy: functional (basic), interactive (communicative) and critical literacy (Nutbeam, 2000). Functional literacy is defined as basic reading, writing and literacy skills, and includes knowledge of health conditions and health systems (Chinn, 2011). Interactive literacy is a more advanced skill than functional literacy that involves the ability to communicate and exchange health information from varying sources and modify new information to adapt to different circumstances (Van der Heide et al., 2015). Critical literacy is the most advanced level of health literacy and requires the individual to have cognitive and social skills needed to critically evaluate health information and question its reliability and credibility before applying it to personal situations and life events (Chinn, 2011; Van der Heide et al., 2015).

Health literacy may impact college students in a number of ways. For instance, not all college students use healthcare services to address preventable conditions or manage health behaviors. In a study consisting of twenty-three universities with 730,000 enrolled students, 900,000 unique visits to the student health services were recorded each year (Turner & Keller, 2015). However, less than half of college females (40.6%) reported having a routine

gynaecological exam in the last 12 months, and only 28.9 % of college students had reported getting tested for the Human Immunodeficiency Virus (HIV) infection (American College Health Association, 2017). Health literacy can play a role in facilitating access to health care.

Health literacy can also impact familiarity with health insurance. Acquiring, understanding, and sufficiently utilizing a health insurance plan are positive health behaviors that many college students ought to adapt. However, many lack knowledge on their health insurance plan because they are covered by their parents' health insurance plan during and after college, especially because the Affordable Care Act (ACA) makes it possible for them to rely on their parent's insurance until they are 26 years of age (Mackert et al., 2017).

Finally, there are many studies examining health behaviors in college students. One study showed that the weight of college students in their fourth year was significantly higher than their weight during their first year, leading to an increased proportion of obese and overweight students (Pope, Hansen & Harvey, 2017). Other studies have looked at health behaviors such as alcohol use (White & Hingson, 2014; White, Jamieson-Drake, & Swartzwelder, 2002), safe driving (Beck, Lee, & Weiner, 2018), sleep deprivation (Hershner & Chervin, 2014) and social smoking (Waters et al., 2006). In several studies, health literacy has been shown to have a significant association with health behavior. In a study with adolescents and young adults, poor health literacy was associated with obesity and smoking (Sansom-Daly et al., 2016). In a Thailand study, university students who had already engaged in sexual intercourse and had a low health literacy were more likely to ignore contraception use (Thongnopakun, Pumpaibool & Somrongthong, 2018). Hence, understanding the health literacy level of college students may enable researchers to examine its association to both risky and health-promoting behaviors.

In order to fully understand the role that health literacy plays in the health of college students, it is critical to identify reasonable measurements of health literacy for this

population. A lack of good measures limits research exploring what factors predict health literacy or how health literacy impacts health outcomes. It is also important to consider there is not one all-encompassing measure of health literacy. Instead, college students' health literacy can be investigated using different measurements, but each of them assesses different skills related to health literacy. A greater understanding of how different measures assess health literacy among college students is needed.

Some health literacy measures are tools that assess actual skills. One is the Test of Functional Health Literacy in Adults (TOFHLA), which measures a person's ability to read and comprehend health information (Parker et al., 1995). In one study where the TOFHLA was used, white college students had higher scores than both black and Hispanic students, and the male college students had higher scores than their female counterparts (Ickes & Cottrell, 2010). The Shortened Functional Health Literacy in Adults (S-TOFHLA) is a compressed version that takes only 12 minutes to administer (10 minutes shorter than the TOFHLA; Baker, et al., 1999). Both consist of prose (reading and comprehension) and numeracy questions. In a recent study were the S-TOFHLA was used in a sample of urban community college undergraduates, 33.3% of Asian or Pacific Islanders were not health literate which was comparatively higher than other races, where 7.7% of white, 16.2% of black/African American, and 12.9% of Hispanic-Latino subjects qualified as not health literate. The result was due to Asian or Pacific Islanders speaking a language other than English at home (Hansen, Shneyderman, & Belcastro, 2015).

Another skill-based tool is the Rapid Estimate of Adolescent Literacy in Medicine (REALM-Teen), which is modeled after the Rapid Estimate of Adult Literacy in Medicine (REALM). It is a word recognition instrument that can measure a person's ability to pronounce or decode words in ascending order of difficulty. The test words provided are health terms commonly used by most adolescents. It is not a reading comprehension

instrument like S-TOFHLA (Davis et al., 2006). In one study of college students using the REALM-Teen, nearly a quarter of participants had low health literacy, which was positively associated with younger age, Black race, free lunch status, and lower parental education (Chisolm et al., 2014). There is also a newer short version of the REALM-Teen, called the REALM-TeenS (Manganello, 2017).

The Newest Vital Sign (NVS) is another skills-based tool that measures whether someone has a low health literacy. It is simple and quick to conduct, requiring only six minutes. It is based on a nutrition label for ice cream and can be administered in either English or Spanish. People are given the label and asked to refer back to the label while answering six questions on nutrition (calories per serving) and health (allergies) (Pfizer.com, 2018). In one study where the NVS was used, college students studying nursing, or another health-related major had higher health literacy scores compared to other college students (Joseph et al., 2016).

There are also self-report questions that have been validated to assess health literacy. The Single Item Health Literacy Screening (SILS) is a single item question that is often used to measure health literacy. It measures the need for help with reading health-related materials. The main objective of the question is to provide a way to identify limited reading ability in a survey format (Morris et. al, 2006). Other self-report tools not assessed in this study include the Ishikawa 14 Item health literacy Scale (HLS-14) (Ishikawa, Takeuchi & Yano, 2008), the Health Literacy Assessment Scale for Adolescents (HAS-A) (Manganello et al., 2015), and the Health Literacy Skills Instrument (HLSI) and its condensed version, the Health Literacy Skills Instrument-Short Form (HLSI-SF) (Smith & Samar, 2016).

While there are many tools that have been used to measure health literacy, few studies have assessed and compared measurement tools specifically for college students. One study developed a comprehensive health literacy assessment tool specifically designed for college

students comprising of comprehension, numeracy, media, and digital literacy n items used to assess health literacy levels. However, the test takes 30 to 45 minutes to administer because it consists of 51 items (Harper, 2014).

A more recent study investigated how the NVS can predict health literacy of college students and compared different modes of administration. Health practitioners often administer the NVS orally in-person, where they read the test out loud, and receive a verbal response from their participants. However, this traditional method can be time-consuming and requires in-person interviews. The finding of this study is that the NVS is equivalent when it is administered to college students in paper-based, online, and in-person formats (Mackert, Champlin & Mabry-Flynn, 2017).

For this study, we chose to compare how four measurement tools (NVS, S-TOFHLA, REALM-Teen & SILS) can produce varying health literacy assessments in college students. While one would expect tools measuring different skills to produce different results, it is important to better understand the variations. Hence, the study seeks to answer the following research questions for a sample of college students:

(1) How do health literacy scores vary by type of tool used?

(2) What sociodemographic factors are associated with low health literacy for each measure?

METHOD

Sample

Data was collected at a public university in the Northeast region of the United States. Recruitment occurred through two methods-a class survey administration (n=190) and flyer recruitment (n=59), for a total of 249 participants. Participants from the class completed the survey during a class session and scheduled a follow-up appointment to complete the health literacy assessments, as these could not be done in a group setting in order to maintain privacy as some tools require administration by an interviewer as described below. Participants recruited through flyers completed both the self-administered paper survey and the health literacy assessments at one study appointment. Because only 63 (33%) of those participants recruited through a class completed the second part of the study (health literacy assessment), the sample size was 122 for the health literacy assessments. The sample size of 127 participants who did not take the health literacy assessments were excluded from the data analysis.

When comparing demographics for students from the class who completed the survey and health literacy assessment and those who only completed the survey, there were no statistically significant differences. There were also few differences between those students who participated via the class compared to those who were recruited through the flyer, with the exception that those recruited through flyers were more likely to have a father with a graduate degree (15% vs. 31%). When compared to the university population as a whole, the sample had more females (70% sample vs. 49% university) and slightly more White students (68% sample vs. 59% university), but similar percentages of Black (12% sample vs. 10% university) and Hispanic students (12% sample vs. 10% university).

The self-administered paper survey included questions asking about demographic information, self-report health literacy (SILS), health information seeking, and media use, some of which were newly developed and many of which had been used and validated in

previous research (Bennett, Robbins, & Haecker, 2003; Chew, Bradley, & Boyka, 2004; Ishikawa, Takeuchi, & Yano, 2008). This study was approved by the University at Albany Institutional Review Board. Participants were required to be at last 18 years of age and received ten dollars if they completed both the survey and the literacy assessment tools.

Health Literacy Variables

There was one self-report question, the SILS, for assessing health literacy in college students. The question was "How often do you have someone help you read information you get from your doctor?". The options of this variable included "Often, Sometimes, Rarely or Never". If the college students chose either "Often or Sometimes", they were identified as SILS negative while others who chose "Rarely or Never" were identified as SILS positive. SILS negative meant that they might have low health literacy while SILS positive meant that they have adequate health literacy (Morris et. al, 2006).

Three tools that assessed skills were administered in person for a sunsample of participants. The first tool was the Rapid Estimate of Adolescent Literacy in Medicine (REALM-Teen), a word recognition test (Davis et al., 2006) where respondents were asked to read a list of 66 words to an interviewer and lost a point for each word they were unable to pronounce. The second tool was the Newest Vital Sign (NVS) (Weiss, 2005) where respondents were given a sample nutrition label and asked a series of questions by an interviewer assessing both reading and numeracy skills.

In order to compare people with lower and higher levels of health literacy, participants were placed into one of two groups: low health literacy and adequate health literacy. The low health literacy group included respondents with a REALM-Teen score of 62 or less (reading below a 10^{th} grade level per scoring instructions, n=21) or an NVS score of 3 or less (less than adequate literacy per scoring instructions, n=15).

The third tool was the S-TOFHLA. The participating college students were required to answer its prose (reading and comprehension) and numeracy questions accurately. The scores can be divided into Inadequate (0-16), Marginal (17-22), and Adequate (23-36) Functional Health Literacy. All college students scored high (26-36) on the S-TOFHLA; thus, they were all predicted to have an Adequate Functional Health Literacy. For this reason, the S-TOFHLA data was excluded from the data analysis investigating the association between the sociodemographic factors and the measurement tools.

Sociodemographic variables

These included race, school year, language spoken at home, mother's level of education, father's level of education, and health status. The race variable consisted of "White", "Asian or Pacific Islander", "African American", "American Indian/Eskimo" (no participants identified as this group), and "Other". However, it was compressed to one binary category, "White" and "Non-White". For the school year variable, the college students could identify as either a "First year", "Second year", "Third year", "Fourth year", "Fifth year or more". The number of college students who identified as fifth year or more were small compared to the other groups, so they were included into the fourth-year category which then became fourth year or more. They also had to identify if they spoke "English", "Spanish", "Chinese, or "Other" as the language spoken at home. These language categories were divided into two groups, "English" or "Non-English" speaker at home. Both mother's and father's level of education consisted of the same options which include "Less than High School", "High School Graduate", "Some College", "College Graduate", "Graduate level Work", and "Don't know". However, the variables were compressed into a binary form, "Less than college degree" and "At least College degree".

Analysis

Data from both parts of the study were entered into Microsoft Excel (Microsoft, 2014). Both STATA (StataCorp, 2005) and STATA/IC 15.1 (StataCorp, 2017) were used for data cleaning and analysis. Fisher's exact tests were used to analyse differences between groups given small cell frequencies, and logistic regression was used to investigate the association between the sociodemographic factors and low-health literacy measurement tool. Health literacy measures classified into low and adequate were the dependent variables, while demographic factors were included as predictors. The same model with the same predictors was run for each of the three measures, REALM-Teen, NVS, and SILS.

RESULTS

Score distribution with HL measurement tools.

Table 1 describes the score distribution for the 122 college participants who took all the health literacy assessments (NVS, REALM-Teen, SILS, and S-TOFHLA). Students had varying scores based on the administered tool. The S-TOFHLA showed 100% of college students scoring in the highest range (23-36), while other measurement tools had at least some students with low scores. The SILS had the highest percentage (20%) of college students scoring in the low health literacy category (SILS < 2).

Table 1: *The score distribution for NVS, REALM-Teen, SILS and S-TOFHLA (n = 122).*

	Frequency	**Percentage (%)**
NVS		
0-1*	**2**	2
2-3*	**13**	11
4-6	**107**	88
REALM-Teen		
4th-5th grade*	**2**	2
6th-7th grade*	**3**	2
8-9th grade*	**16**	13
10th grade+	**101**	83
S-TOFHLA		
0-16*	**0**	0
17-22*	**0**	0
23-36	**122**	100
SILS		
SILS < 2*	**25**	20
SILS > 2	**95**	80

*Low health literacy

Investigating variation of health literacy scores by type of HL measurement tool used.

Table 2 shows the linear relationship strength between measurement tools. Using spearman rho, the continuous variables of the measurement tools (raw scores) were analysed

to discover the linear associations in different pairs. REALM-Teen can be shown to have a significant linear association with NVS (r = .184, n = 122, p< .05).) and S-TOFHLA (r = .250, n = 122, p< .05). SILS also has a significant negative association with S-TOFHLA (r = -.251, n = 122, p< .05).

Table 2. *Correlation coefficients between NVS, REALM-Teen, S-TOFHLA, and Single-item health literacy measure (SILS).*

	NVS	REALM-Teen	SILS	STOFHLA
NVS	1			
REALM-Teen	.184*	1		
SILS	-.120	-.051	1	
S-TOFHLA	.153	.250*	-.251*	1

Note. Coefficients reflect Spearman's rho correlations.
*Correlations are significant at the *.05* level.

Table 3 shows the categorical association of the measurement tools, when they are compared with each other using the Fisher's exact test. It also displays the percentage of college students (n = 122) with low health literacy in any two administered tests. College students who scored low in both SILS and NVS represented the highest percentage (4.94%) of college students who scored low with two tools.

Table 3. *Fisher's exact test reflecting students with low health literacy in each pair of measures (n =122).*

	NVS		REALM-Teen		SILS	
	Freq (%)	p-value	Freq (%)	p-value	Freq (%)	p-value
NVS	-					
REALM-Teen	4 (3.28)	.289	-			
SILS	6 (4.92)	.08	5 (4.10)	.767	-	

*p-values are significant at the .05 level

Sociodemographic factors and association with low health literacy.

Table 4 presents the percentage of college students with adequate or low health literacy depending on their sociodemographic status. It also shows associations were

statistically significant when comparing the sociodemographic variables and the health literacy scores. There was no significant association found for school year and low health literacy with SILS (p = 0.267), NVS (p = 0.535) and REALM-Teen (p = 0.629). Mother's education also had no significant association with low health literacy using SILS (p = 0.368), NVS (p = 0.159) and REALM-Teen (p = 0.218). There was no significant association with the health status of the college students and low health literacy with SILS (p = 0.059), NVS (p = 0.115) and REALM-Teen (p = 0.586).

Table 4: *The percentage of participants with high or low HL in SILS, NVS and REALM-Teen based on demographics (n = 122)*

Demographics	SILS			NVS			REALM-Teen		
	High HL (%)	Low HL (%)	p-value	High HL (%)	Low HL (%)	p-value	High HL (%)	Low HL (%)	p-value
Race			.624			.234			.000*
White	78.31	21.69		90.36	9.64		95.18	4.82	
Non-white	84.21	15.79		81.58	18.42		55.26	44.74	
Home Language			.780			.172			.000*
English	78.57	21.43		89.80	10.20		92.86	7.14	
Non-English	83.33	16.67		79.17	20.83		41.67	58.33	
School year			.267			.535			.629
1st year	72.73	27.27		90.91	9.09		84.09	15.91	
2nd year	78.57	21.43		82.14	17.86		85.71	14.29	
3rd year	90.63	9.38		84.38	15.63		75.00	25.00	
4th year+	71.43	28.57		94.44	5.56		88.89	11.11	
Father's education			.489			.003*			.040*
Less than College degree	82.98	17.02		76.60	23.40		87.80	25.53	
At least College degree	76.81	23.19		95.45	4.55		92.86	10.14	
Mother's education			.368			.159			.218
Less than College degree	90.74	9.26		83.33	16.67		80.96	22.22	
At least College degree	75.38	24.62		92.31	7.69		100.00	12.31	
Health status			.059			.115			.586
Poor	40.00	60		60.00	40.00		99.82	0.18	
Good	81.03	18.97		88.79	11.21		100.00	0.00	

*p-values are significant at the .05 level

For NVS, the percentage of college students with low health literacy was approximately double for non-whites (18.42%) compared to whites (9.64%), but this difference was not statistically significant (p = 0.234). There was also no significant association for race and low health literacy using SILS as a measure (p = 0.624). The REALM-Teen had a significant association with race where non-white college students had 11 times the percentage of low health literacy (44.74%) than white college students (4.82%, $p < .0001$).

Language spoken at home was shown to have a significant association with low health literacy measured with REALM-Teen (p < 0.001). College students who spoke a different language from English at home had a larger proportion of college students having a low health literacy (58.33%) than a high health literacy (41.67%) with the REALM-Teen.

Father's education had a significant association with low health literacy measured with both the NVS (p = 0.003) and REALM-Teen (p = 0.040). For NVS, the percentage of low health literacy for college students who had fathers with less than a college degree was 23.40% while the percentage of low health literacy for those who had fathers with at least a college degree was 4.55% (p= 0.003). For REALM-Teen, 25.53% of college students who had father with less than a college degree had low health literacy levels while 10.14% of those who had fathers with at least a college degree had low health literacy levels (p= 0.040).

Table 5 shows results from the logistic regression models from the sociodemographic variables predicting NVS, REALM-Teen and SILS. Students whose father had at least a college degree were 5.44 times more likely to have adequate health literacy in NVS than students whose father had some or less than college education (OR =5.44, 95% CI = 1.19, 24.79). Non-white students were 91% less likely to have adequate health literacy in REALM-Teen compared to white students (OR= .09, 95% CI = .02, .49). Students who used a language other than English at home were 93% less likely to have adequate health literacy in

REALM-Teen relative to those students who used English at home (OR= .07, 95% CI = .02, .35). Other variables were not found to be significant predictors of low health literacy in the multivariate models.

Table 5. *Logistic regression models predicting NVS, REALM, and SILS (n = 122).*

	NVS OR [95% CI]	REALM-Teen OR [95% CI]	SILS OR [95% CI]
Race/ethnicity (ref: White)			
Non-white	.84 [.18, .19]	.09* [.02, .49]	.52 [.13, 2.17]
Home language (ref: English)			
Non-English	1.29 [.22, 7.46]	.07* [.02, .35]	1.67 [.35, 8.01]
School year (ref: 1st year)			
2nd year	.47 [.01, 2.18]	1.43 [.23, 8.94]	.82 [.24, 2.79]
3rd year	.86 [.17, 4.34]	.82 [.13, 5.34]	.19 [.04, 1.02]
4th year or more	1.93 [.18, 2.72]	.20 [.02, 1.89]	.76 [.19, 3.08]
Mother education (ref: Less than college degree)			
At least college degree	1.56 [.35, 6.87]	.52 [.09, 3.00]	1.16 [.39, 3.40]
Father education (ref: Less than college degree)			
At least college degree	5.44* [1.19, 24.79]	1.19 [.23, 6.07]	1.33 [.43, 4.05]
Health status (ref: Poor)			
Good	.20 [.02, 1.82]	-	7.23 [.96, 54.46]

*p-values are significant at the .05 level.

DISCUSSION

The objective of the study was to assess the variation in scores by health literacy measurement tool (SILS, NVS, REALM-Teen and S-TOFHLA) and investigate how the sociodemographic factors were associated with each tool measured low health literacy. Although the tools measure health literacy in different ways, some of them were shown to be significantly associated with one another. REALM-Teen had a significant linear association with NVS and S-TOFHLA, while SILS was shown to have a significant linear association with S-TOFHLA.

The sociodemographic factors significantly associated with the tools included race, language spoken at home and father's level of education. The participants' father's level of education was a significant predictor of low health literacy with NVS. In other words, college students who had a father with less than a college degree were more likely to score low on NVS. In this current study, mother's level of education was not significantly associated to any of the measurement tools. In a 2017 study in Chongqing, China, military college students whose father's level of education was either high school or university had significantly lower health literacy levels than those with fathers with a postgraduate level education (Rong et al., 2017). In another study, mother's level of education was significantly associated with health-related knowledge in vocational college students in Nanyang, Henan, China. Both studies used the Chinese Health Literacy Questionnaire (Wang et al., 2014). Future studies should further investigate how father's and mother's level of education are related to the level of health literacy in college students.

Both race and language spoken at home were significantly associated with low health literacy with REALM-teen. The tool was only available in English (Weiss, 2005, Davis et al., 2006). This might explain why college students who spoke a foreign language at home were more likely to score low in REALM-Teen. They might have had difficulty performing well

on the test because it involves the pronunciation of words in English. Non-white college students were also more likely to have a low health literacy measured with REALM-Teen. This is partially due to the fact that non-white students in the sample were more likely to speak a foreign language and showed a collinear relationship with each other ($p < 0.0001$).

Although S-TOFHLA is designed after the TOFHLA (the most popular health literacy test in health system research), all college students had high scores (Weiss, 2005)., there were no college students with low health literacy in S-TOFHLA so the association with the socio-demographic factors could not be investigated. Likewise, no sociodemographic factors were associated with low health literacy from the SILS. Further research is needed to better understand what other factors might be related to scores for these tools.

In order to apply for college admission, college students have to take the SAT. The SAT is a paper-based standardized test that comprises of a reading, writing and language, math with and without a calculator, and an optional essay. According to the College Board, the SAT measures literacy, numeracy and writing skills that are needed for academic success in college. This means that college students have already been screened through the SAT and admissions process to have an adequate functional literacy ("The College Board", 2018), suggesting that students should be able to do reasonably well on functional health literacy tools. It may be a more complex tool is needed to differentiate low and high health literacy in a college student population. A suitable measurement tool for college students should also be able to measure both interactive and critical health literacy.

The strength of the study was that it involved the use of four validated health literacy measurement tools. However, there were some limitations. The study used a cross-sectional design, serving as a screenshot of the represented students and not actually showing causation (Hansen et al, 2015). The survey involved self-report questions which might have included some response bias. Some data were missing because the college students did not know both

or one of their parent's work and education level. There was also an unequal distribution of male (31%) and female students (69%) in the sample.

CONCLUSION

Health literacy in college students can be measured using different measurement tools (NVS, S-TOFHLA, REALM-teen & SILS). The tools have varying levels of sensitivity with each tool measuring different skills. Hence, some students who had high literacy scores using some measurement tools were identified as having low health literacy with other tools. The S-TOFHLA was not useful since all the participants score high. It is also important to consider there is not one all-encompassing measure of health literacy. Instead, college students' health literacy can be investigated using different measurements, but each of them assessing different skills related to health literacy. Hence, researchers and practitioners should develop a new tool or a combination of tools that are most appropriate for measuring health literacy in the population.

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