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## The Effect of a Child's Guardian's Health Literacy on Asthma Knowledge in Pediatric Patients

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DNP Final Project Report

The Effect of a Child's Guardian's Health Literacy on Asthma Knowledge in Pediatric Patients

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College of Nursing

Spring 2019

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## Dedication

This manuscript is dedicated to my parents for all their support over the past eight years of my nursing education. Without their endless love and encouragement, I would not be where I am today. I would also like to dedicate my DNP project to Joseph Yazell, who always knows how to put a smile on my face, even on my most stressful days. I can't wait for many homework free weekends together.

## Acknowledgements

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## **Abstract**

PURPOSE: The purpose of this project is to determine if there is a correlation between a guardian's health literacy and their knowledge of their child's asthma management.

METHODS: This is a cross sectional study conducted in the University of Kentucky Pediatric Pulmonology Clinic in Lexington, Kentucky. The analysis focused on how a parent's health literacy level effected their asthma knowledge. The Rapid Estimation of Adult Literacy in Medicine-Short Form was used to measure health literacy. An asthma knowledge questionnaire with a Likert-scale design was used to measure asthma knowledge. The sample included eight parents of children with an asthma diagnosis collected between January 2019 and March 2019.

RESULTS: A Spearman's Rho correlation test was conducted. However, the results were not shown to be statistically significant, possibly due to a small sample size and limited variability in REALM-SF scores. When comparing the average scores of participants with a high school REALM-SF score to the participant with a middle school REALM-SF score, there was an 8-point difference in asthma knowledge.

CONCLUSION: While the study results were not statistically significant, if the study was repeated with a larger sample size and more variability in REALM-SF scores there may be a statistically significant difference. Health literacy could be a guiding factor in how to educate patients and families.

## **Background**

Asthma affects about 8% of children in the United States and is a leading cause of childhood morbidity (Harrington, Zhang, Magruder, Bailey & Gerald, 2015). In 2012, 10.2% of children in Kentucky were living with asthma (Kentucky Department for Public Health, 2012). Children diagnosed with asthma miss more school than children without asthma. Sixteen percent of children with asthma missed more than 11 days of school compared to 2% of children without asthma (Kentucky Department for Public Health, 2012). Asthma has a greater impact on children from low income populations and minority backgrounds (Harrington et al., 2015). These populations also frequently have low health literacy.

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” (U.S. Department of Health and Human Services, 2010, p2.). Additionally, health literacy is impacted by many factors including culture, language, literacy level, prior experience with healthcare, numeracy and communication skills. Only 12% of adults in the United States have proficient health literacy and 14% have below basic health literacy (U.S. Department of Health and Human Services, 2010).

Populations at risk for low health literacy are the same populations that are at increased risk for asthma including racial minorities, people with less than a high school degree, low income populations and non-native English speakers (U.S. Department of Health and Human Services, 2010). Low health literacy can result in incorrect home asthma care, misunderstanding of emergency protocols and barriers to needed asthma care (Harrington, et al., 2015). Black and Hispanic children have increased asthma complications, such as increased emergency department visits and asthma severity (Harrington, et al., 2015). Black and Hispanic adults also have lower levels of health literacy (Harrington, et al., 2015). There are several contributing

factors impacting health discrepancies: Pediatric populations that have disproportionate higher asthma diagnoses also have lower health literacy levels, less access to healthcare and lower socioeconomic levels (Harrington, et al., 2015). These factors could contribute to worse asthma management, increased ED visits, increased hospitalizations, and increased school absences (Harrington, et al., 2015).

This study was based on the process-knowledge model of health literacy (Figure 1). The process-knowledge model of health literacy was developed in 2011 by investigating the effects of processing capacity, general knowledge and health knowledge on health literacy (Chin et al., 2011). The model states that processing capacity, general knowledge and health-specific knowledge all impact health literacy (Chin et al., 2011). Age, education and illness experience also impact health literacy, which then impacts the ability for self-care (Chin et al., 2011)

### **Purpose**

The purpose of this project was to determine if there is a correlation between a guardians' health literacy and their knowledge of their child's asthma management. The specific objective was to assess the effect of guardian's health literacy on the knowledge of their child's asthma management plan in pediatric asthma patients in Lexington, Kentucky. If health literacy does have an effect on the knowledge of children's asthma management, the next step will be to change education protocols and adapt asthma education to different health literacy levels. If health literacy does not have an effect on children's asthma management, other causes for frequent asthma complications will have to be explored.

### **Methods**

#### **Study Design**

This was a cross sectional, exploratory design study. The effects of guardians' health literacy on their knowledge of their children's asthma was analyzed using the REALM-SF (a

measurement tool of health literacy) and an Asthma Knowledge Survey. The sample was taken from the UK pediatric pulmonology clinic.

### **Setting**

The study was conducted at the University of Kentucky Pediatric pulmonology clinic. The UK pediatric pulmonology clinic “offers comprehensive diagnosis and treatment for children and adolescents with a range of chronic lung diseases, respiratory disorders, reactive airway diseases, and sleep-related respiratory problems” (University of Kentucky, 2018). The pediatric pulmonology clinic primarily sees pediatric patients with respiratory disorders and lung diseases from Lexington and surrounding counties.

### **Sample**

The sample included patients who met the following inclusion criteria: 1) if the primary caretaker/guardian brought the child to the appointment, 2) if the asthma diagnosis was over a year ago, 3) if the child was between 5-15 and 4) if the parent/guardian spoke English as their primary language. The sample excluded children who were: 1) 0-5 years of age or 15-18 years of age, 2) had a non-asthma diagnosis as the reason for care, 3) received an asthma diagnosis within the past year, or a 4) whose family did not speak English as a primary language. The list of inclusion and exclusion criteria can be found in table 1.

The total sample was eight guardians of children with asthma. Data was collected from guardians of patients who visited the UK Pediatric Pulmonology clinic between January, 18 2019 and March 8, 2019.

### **Data Collection**

Approval from the University of Kentucky Institutional Review Board (IRB) was obtained in October 2018 prior to collection of data.

The objective of this study was to determine if there is a correlation between health literacy and asthma knowledge. The following measures were obtained from participants:

1. Health Literacy (Figure 2): Health literacy was measured by the Rapid Estimate of Adult Literacy in Medicine-Short Form (REALM-SF; Agency for Healthcare Research and Quality, 2016). The REALM-SF is a 7- question word recognition test during which the participant reads the words out loud to the evaluator (Agency for Healthcare Research and Quality, 2016). If the participant does not recognize the word, they are instructed to say “pass;” this is then scored based on how many of the words the participant read out loud correctly. If the participant reads zero of the seven words correctly they, have a third grade and below reading level and will not be able to read most literary materials (Agency for Healthcare Research and Quality, 2016). If the participant reads 1-3 of the words correctly, they have a fourth through sixth grade reading level and will need low-literacy materials. If the participant reads 4-6 of the words correctly, they have a seventh to eighth grade reading level and will struggle with some patient education materials. If the participant reads all seven correctly, they have a high school reading level and will be able to read most patient education materials (Agency for Healthcare Research and Quality, 2016). The REALM-SF has been validated against the longer 66 question REALM (Johns Hopkins Medicine, 2018). The REALM-SF has a 97% reliability against the REALM and a 0.94 cronbach’s alpha score (Johns Hopkins Medicine, 2018)
2. Asthma knowledge (Figure 3): Asthma knowledge includes how well the caretaker understands their child’s asthma and asthma management, including medication management, which will be measured by the asthma knowledge questionnaire. The asthma knowledge questionnaire is a 10-question survey that has been shown to be reliable in measuring adult caregivers’ knowledge of their children’s asthma (Franken, Veenstra-van Schie, Ahmad, Koopman, Versteegh, 2018). This questionnaire was adapted from a validated asthma knowledge questionnaire that is used to assess adults’ knowledge of their own asthma (Franken, et al., 2018). The Cronbach alpha test of reliability score was 0.73 (Franken et al., 2018).

The questions are Likert style with the options as 1: strongly disagree, 2: disagree, 3: neither agree nor disagree, 4: agree and 5: strongly agree (Franken et. Al., 2018). The range of scores on the Asthma Knowledge Questionnaire is 10-50. A perfect score is a 50.

3. Demographics (Figure 4): The demographic variables collected include race, income, length of asthma diagnosis, age of child and education level of parent/guardian.

### **Data Analysis**

The study data was analyzed using Statistical Package for the Social Sciences (SPSS) software in the analysis of the data. Descriptive analysis was used in the analysis of the demographics of the sample using means with standard deviations for interval variables and frequencies with percentages for nominal and ordinal variables. The association between health literacy level (using the REALM-SF score) and asthma knowledge (using the asthma knowledge questionnaire score) was examined using Spearman's Rho Correlation test. Spearman's Rho is used to determine a correlation between two ordinal variables, such as the REALM-SF score and Asthma Knowledge Questionnaire score.

## **Results**

### **Sample Characteristics**

The sample included eight parents, two fathers and six mothers. Three of the parents were in the 20-30 age range, three were in the 30-40 age range and two were in the 40-50 age range. Two of the children had asthma for 2 years, two of the children had asthma for 2-5 years and four of the children had asthma for over 5 years. Six of the children were 5-8 years old, one child was 8-12 years old and one of the children was older than 12 years old. Four of the parents were high school graduates, two of the parents had some college and two of the parents were college graduates. Three of the families fell into the \$35,000-\$50,000 income range, three families were

below the \$35,000-\$50,000 income range and one family's annual income was over \$75,000.

Sample characteristics can be found in table 3.

### **Health Literacy Levels**

Seven of the participants had perfect scores of seven on the REALM-SF. This translates to a high school reading level. One participant had a score of five on the REALM-SF which translates to a seventh-grade reading level. The REALM-SF scoring system compares the seventh-grade reading level to struggling to read "most patient education materials" (Agency for Healthcare Research and Quality, 2016).

### **Asthma Knowledge Questionnaire Score**

The Asthma Knowledge Questionnaire has a range of scores from 10-50 with 50 being a perfect score. The average score on the Asthma Knowledge Questionnaire was a 38 with a range from 20-48. The scores included an outlier of 20, four scores in the 30's and three in the 40's.

### **Relationship between Health Literacy Levels and Asthma Knowledge Levels**

The Spearman's Rho correlation test between the REALM-SF score and Asthma Knowledge Questionnaire scores had a correlation coefficient of 0.415 and a P-Value of 0.307. There was no statistical significance in the relationship between health literacy levels and asthma knowledge levels. However, because there is only one participant with a different REALM-SF score, the results are difficult to analyze. The participant who scored a 5 on the REALM-SF scored a 31 on the Asthma Knowledge Questionnaire. For the participants who scored a 7 on the REALM-SF, the average score on the Asthma Knowledge Questionnaire is a 38. If the outlier score of 20 is removed, the average score is a 42 for those who scored a 7 on the REALM-SF.

## **Discussion**

The overall aim of this study was to determine if there was a relationship between health literacy levels and asthma knowledge in parents of children with asthma. The REALM-SF scores

were higher than predicted. Seven out of 8 people scored a 7 out of 7 and one person scored a 5 out of 7. A 7 out of 7 on the REALM-SF is comparable to a high school reading level. A score of 5 out of 7 is comparable to a 7<sup>th</sup> or 8<sup>th</sup> grade reading level. All participants graduated from high school according to the self-reported demographics survey.

According to the Census Bureau (2018), 85% of Kentuckians have a high school diploma, 14% have less than a high school education and 1% have no education. All eight of the participants in this study had a high-school education, and seven of the eight participants, or 87%, had the equivalent health literacy level for a high school education. The REALM-SF results are similar to the population of Kentucky.

In the eight participants, there was not a statistically significant correlation between REALM-SF scores and asthma knowledge scores. However, when comparing the asthma knowledge results between the participant with a REALM-SF score of 5 to the participants with a REALM-SF score of 7, there is a difference in the average. The average asthma knowledge score of participants with a REALM-SF score of 7 is 38, compared to an asthma knowledge score of 31 for the participant who scored a 5 on the REALM-SF. This suggests that in a larger sample with more variety in health literacy levels, there may be a statistically significant difference between health literacy levels and asthma knowledge.

### **Limitations**

There were several limitations to this study. The first limitation was the remodeling of the UK Pediatric Pulmonology Clinic. The pulmonology clinic was operating in an old clinic space during the data collection. The space has fewer exam rooms and less space for providers therefore, less space for research to be conducted. Because of this and because of outside time limitations, research was only able to be conducted on Fridays, limiting the number of potential participants.

Another limitation, which relates to the clinic space and time availability, was the sample size. The sample size of eight participants is not enough to be representative or inclusive. Ideally, the participants could have been recruited on several clinic days throughout the week or at a specific asthma clinic day.

The sample size limitation led to the third limitation, not enough variety in REALM-SF scores. The REALM-SF score results were unexpected based on the population of the clinic, a variety of patients from Eastern and Central Kentucky. The lack of variety in the REALM-SF scores prevents the study from determining a correlation between health literacy and asthma knowledge.

An additional limitation included what the study could measure. The study originally set out to measure how a parent's health literacy impacted that parent's asthma knowledge and their child's asthma outcomes. Ideally, a FEV1% level would have been collected as part of the study data; however, to keep the confidentiality of the participants and to prevent children from being the subjects, FEV1% levels were not collected. There is a gap between knowledge and action. This study showed that most participants had proficient asthma knowledge but without relating this to asthma outcomes, the next connection to asthma outcomes cannot be made. Ideally, a relationship would be made between health literacy, asthma knowledge and asthma outcomes.

### **Recommendations for Future Studies**

Future studies should include more participants. By increasing the sample size, the reliability and variety could be increased. Accurately determining if health literacy and asthma knowledge is related could improve asthma management.

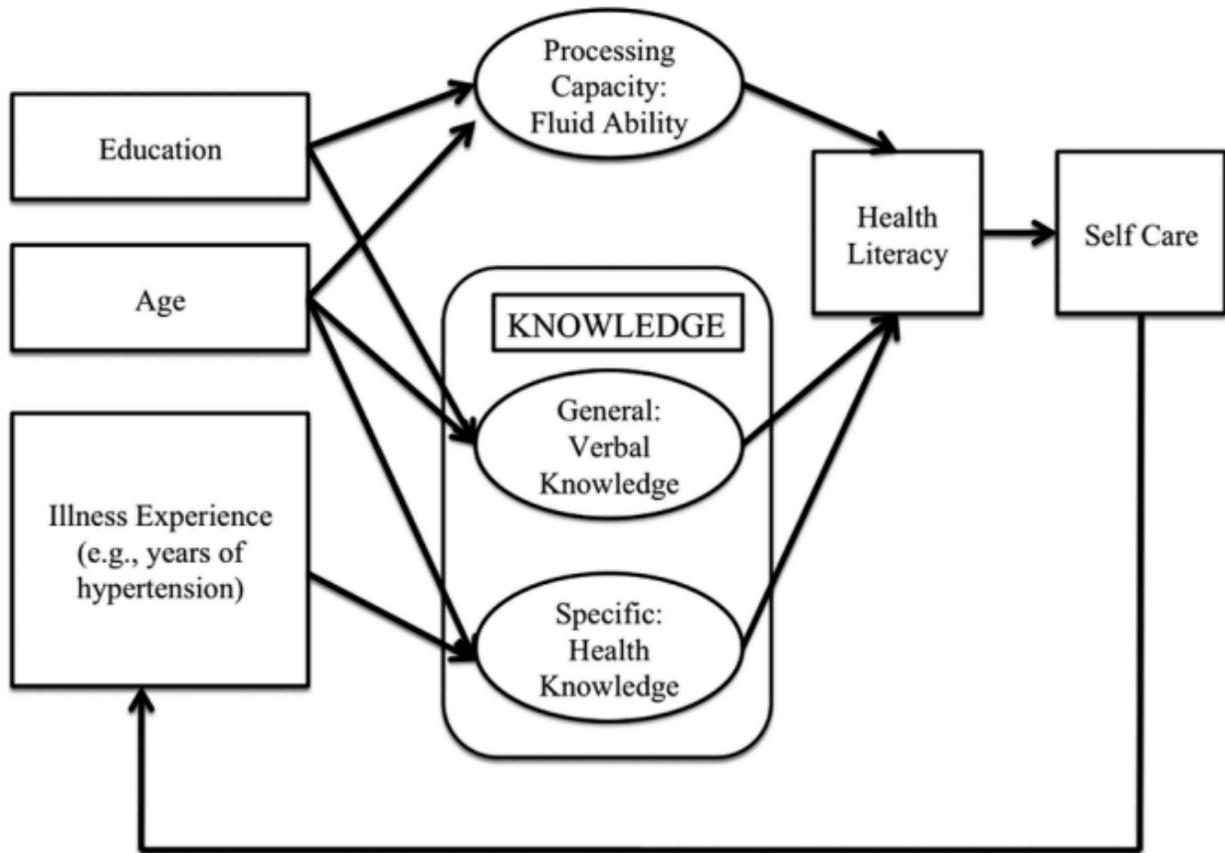
Additionally, the future studies should include FEV1% levels to determine a connection between health literacy, asthma knowledge and asthma outcomes. It is possible that despite having a high health literacy level and proficient asthma knowledge, the asthma outcomes are

still not ideal. It is also possible that without having proficient asthma knowledge, the asthma outcomes are still satisfactory. In order to show a true relationship in health literacy and asthma outcomes, FEV1% levels are needed.

### **Conclusion**

Asthma is a chronic condition that impacts many aspects of a child's life. It can require multiple medications, multiple visits to the pulmonologist and lifestyle changes. When asthma is diagnosed in children, the parents are responsible for their asthma care. A new diagnosis of asthma includes a plethora of information and education. Designing education around the patient and their family is important. Determining if health literacy impacts a parent's asthma knowledge can give providers valuable insight into how to adjust teaching methods for higher or lower education levels. This study had a small sample size, preventing any statistically significant findings. However, there was an 8-point difference of average asthma knowledge score seen between the participant with a health literacy score of 5 and those who scored a 7. These findings suggest that in a larger more diverse sample, a statistically significant difference may be found. Health literacy is an important indicator of how well a patient can read health education materials. Knowing a patient and family's health literacy levels will allow for providers to create better educational experiences for patients and families.

Figure 1. The Process-Knowledge Model of Health Literacy  
This figure illustrates the process-knowledge model of health literacy.



*Table 1.* Inclusion and Exclusion Criteria for Involvement in the Study.

<b>Exclusion Criteria</b>	<b>Inclusion Criteria</b>
Children under 5 or 15-18 years old	Primary caregiver at the appointment
Non-asthma diagnosis as reason for care	Child aged 5-15
Asthma diagnosis within one year of appointment	Asthma diagnosis over a year ago
Non-English speaking	Primarily English speaking

Table 2. Level of Measurement for Variables Included in the Study

Variable	Scoring/Measure	Level of Measurement
Sex	Male vs. Female	Nominal
Age of Child	# of years	Interval
Race	Caucasian, Hispanic, African American, Native American, Other	Nominal
Income	\$0-\$20,000, \$20,000-\$40,000, \$40,000-\$60,000, \$60,000-\$80,000, \$80,000-\$100,000, over \$100,000	Ordinal
Length of asthma diagnosis	# of years	Ordinal
Education level of parent/guardian	Less than high school, high school graduate, some college, college graduate, some grad school, grad school graduate	Nominal
Asthma Knowledge	Asthma Knowledge Questionnaire	Interval
Health literacy	Score on REALM from 9-7	Interval
Variable	Scoring/Measure	Level of Measurement
Sex	Male vs. Female	Nominal
Age of Child	# of years	Interval
Race	Caucasian, Hispanic, African American, Native American, Other	Nominal
Income	\$0-\$20,000, \$20,000-\$40,000, \$40,000-\$60,000, \$60,000-\$80,000, \$80,000-\$100,000, over \$100,000	Ordinal
Length of asthma diagnosis	# of years	Ordinal
Education level of parent/guardian	Less than high school, high school graduate, some college, college graduate, some grad school, grad school graduate	Nominal
Asthma Knowledge	Asthma Knowledge Questionnaire	Interval
Health literacy	Score on REALM from 9-7	Interval

Figure 2. Rapid Estimation of Adult Literacy in Medicine- Short Form

Menopause	<input type="checkbox"/>
Antibiotics	<input type="checkbox"/>
Exercise	<input type="checkbox"/>
Jaundice	<input type="checkbox"/>
Rectal	<input type="checkbox"/>
Anemia	<input type="checkbox"/>
Behavior	<input type="checkbox"/>

#### Instructions for Administering the REALM-SF

1. Give the patient a laminated copy of the REALM-SF form and score answers on an unlaminated copy that is attached to a clipboard. Hold the clipboard at an angle so that the patient is not distracted by your scoring. Say:

"I want to hear you read as many words as you can from this list. Begin with the first word and read aloud. When you come to a word you cannot read, do the best you can or say, 'blank' and go on to the next word."

2. If the patient takes more than 5 seconds on a word, say 'blank' and point to the next word, if necessary, to move the patient along. If the patient begins to miss every word, have him or her pronounce only known words.

#### Scores and Grade Equivalents for the REALM-SF

<u>Score</u>	<u>Grade Range</u>
0	Third grade and below; will not be able to read most low-literacy materials; will need repeated oral instructions, materials composed primarily of illustrations, or audio or video tapes
1-3	Fourth to sixth grade; will need low-literacy materials, may not be able to read prescription labels
4-6	Seventh to eighth grade; will struggle with most patient education materials; will not be offended by low-literacy materials
7	High school; will be able to read most patient education materials

(Agency for Healthcare Research and Quality, 2016)

Figure 3. Asthma Knowledge Questionnaire

1=strongly disagree, 2=disagree, 3=neither agree nor disagree 4=agree 5=strongly agree

Items	Circle Response
1. Inhaler use can lead to dependence or addiction.	1 2 3 4 5
2. Inhalers can have an <u>affect</u> on the heart or damage it.	1 2 3 4 5
3. It's not good for children to use the inhaler for too long.	1 2 3 4 5
4. Children with asthma should use asthma medications only when they have symptoms (coughing, congestion, or wheezing).	1 2 3 4 5
5. It's better to use inhalers directly, without a holding chamber, so the medication can go more directly to the lungs.	1 2 3 4 5
6. Parents should ask a doctor to tell the school that an asthmatic child shouldn't exercise or participate in physical education classes.	1 2 3 4 5
7. Children who have asthma shouldn't participate in sports that make them run too much.	1 2 3 4 5
8. When a child has an asthma attack it's best to go to the emergency room even if symptoms are mild.	1 2 3 4 5
9. Some medications for asthma don't work unless they're administered every day.	1 2 3 4 5
10. With preventer medications, it does not matter if some doses are missed or if you go on and off them.	1 2 3 4 5

(Franken, et. Al., 2018)

## Figure 4. Demographics Survey

### Demographics Survey

Please circle one response. If you do not feel comfortable answering any of these questions, leave them blank. All responses are confidential and are not associated with your name or your child's name.

1. Child's Age
  - A. 5-10 years old
  - B. 10-12 years
  - C. 12-15 years
  - D. Over 15 years old
  
2. How long has your child been diagnosed with asthma?
  - A. 2 years
  - B. 2-5 years
  - C. Over 5 years
  
3. Your gender
  - A. Male
  - B. Female
  - C. Other
  
4. Your educational level
  - A. No education
  - B. Middle School
  - C. Some high school
  - D. High school graduate
  - E. Some college
  - F. College graduate
  
5. Household income
  - A. Less than \$15,000
  - B. \$15,000-\$25,000
  - C. \$25,000-\$35,000
  - D. \$35,000-\$50,000
  - E. \$50,000-\$75,000
  - F. Over \$75,000
  
6. Your Age
  - A. 20-30 Years Old
  - B. 30-40 Years Old
  - C. 40-50 Years Old
  - D. 50-60 Years Old
  - E. 60-70 Years Old
  - F. Greater than 70 Years Old

Table 3. Demographic Data

<b>Demographic</b>	<b>Mode</b>	<b>Ranges</b>
Age of Parent	20-30 or 30-40 age range	20-40 years of age-3 30-40 years of age-3 40-50 years of age-2
Length of Asthma Diagnosis	Over 5 Years	1-2 years-2 children 2-5 years-2 children Over 5 years-4 children
Education Level	All High School Graduates	4-H.S. Graduates 2-Some College 2-College Graduates
Income Level	Three families in \$35,000-\$50,000	3 less than \$35,000-\$50,000 3 in the \$35,000-\$50,000 range 1 above \$75,000

## References

- Agency for Healthcare Research and Quality. (2016). Health literacy measurement tools. Retrieved from: <https://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/literacy/index.html>
- Akinbami, L., Moorman, J., Bailey, C., Zahran, H., King, M., Johnson, C., Liu, X. (2012). Trends in Asthma Prevalence, Health Care Use, and Mortality in the United States. *National Center for Health Statistics Data Brief No. 94*. Retrieved from: <https://www.cdc.gov/nchs/products/databriefs/db94.htm>
- Asthma and Allergy Foundation of America. (2011). Cost of Asthma on Society. Retrieved from: <http://www.aafa.org/page/cost-of-asthma-on-society.aspx>
- Census Bureau (2018). Educational attainment in Kentucky. Retrieved from: <https://statisticalatlas.com/state/Kentucky/Educational-Attainment>
- Chin, J., Morrow, D., Stine-Morrow, E., Conner-Garcia, T., Graumlich, J., & Murray, M. (2011). The process-knowledge model of health literacy: evidence from a componential analysis of two commonly used measures. *Journal of Health Communication*. 16(3). 222-24.
- Franken, M., Veenstra-van Schie, M., Ahmad, Y., Koopman, H. & Versteegh, F. (2018). The presentation of a short adapted questionnaire to measure asthma knowledge of parents. *BMC Pediatrics*. 18(4). 10.1186/s12887-018-0991-4
- Gandhi, P., Kenzik, K., Thompson, L. et. Al. (2013). Exploring factors influencing asthma control and asthma-specific health-related quality of life among children. *Respiratory Research*. 14 (26).
- Harrington, K., Zhang, B., Magruder, T., Bailey, W., Gerald, L. (2015). The Impact on Parent's Health Literacy on Pediatric Asthma Outcomes. *Pediatric Allergy, Immunology, and Pulmonology*. 28(1). 20-26. 10.1089/ped.2014.0379

Johns Hopkins Medicine. (2018). Health literacy measurement tools. Retrieved from:

[https://www.hopkinsmedicine.org/odcc/resources/health\\_literacy\\_measurement\\_tools.html](https://www.hopkinsmedicine.org/odcc/resources/health_literacy_measurement_tools.html)

Kentucky Department for Public Health. (2012). Kentucky Asthma Surveillance Report 2008-2012. Kentucky Cabinet for Health and Family

Services. <http://chfs.ky.gov/NR/rdonlyres/8FE79D57-E94F-4605-82DB-2EC3ED0C61DC/0/2013AsthmaSurveillanceDocument.pdf>

Kutner, M., Greenberg, E., Jin, Y., and Paulsen, C. (2006). The Health Literacy of America's Adults: Results From the 2003 National Assessment of Adult Literacy (NCES 2006-483). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Pearson, S., Goates, S., Harrykissoon, S., Miller, S. (2014). State-Based Medicaid Costs for Pediatric Asthma Emergency Department Visits. *Preventing Chronic Disease*. 11.

Retrieved from: [https://www.cdc.gov/pcd/issues/2014/14\\_0139.htm#Results](https://www.cdc.gov/pcd/issues/2014/14_0139.htm#Results)

Peterson, P., Shetterly, S., Clarke, C., Bekelman, D., Chan, P., Allen, L., Matlock D., Magid, D. & Masoudi, F. (2011). Health Literacy and Outcomes Among Patients With Heart Failure. *JAMA*. 305(16):1695-1701. doi:10.1001/jama.2011.512

Smith, S., Curtis, L., Wardle, J, von Wagner, C. & Wolf, M. (2013). Skill Set or Mind Set? Associations between Health Literacy, Patient Activation and Health. *PLoS ONE* 8(9)

<https://doi.org/10.1371/journal.pone.0074373>

U.S. Department of Health and Human Services. (2008). America's Health Literacy: Why We Need Accessible Health Information. Retrieved from:

<https://health.gov/communication/literacy/issuebrief/>

U.S. Department of Health and Human Services, Office of Disease Prevention and Health

Promotion. (2010). National Action Plan to Improve Health Literacy. Retrieved from:

[https://health.gov/communication/HLActionPlan/pdf/Health\\_Literacy\\_Action\\_Plan.pdf](https://health.gov/communication/HLActionPlan/pdf/Health_Literacy_Action_Plan.pdf)

U.S. Department of Health and Human Services. (2010). Quick Guide to Health Literacy.

Retrieved from: <https://health.gov/communication/literacy/quickguide/Quickguide.pdf>

University of Kentucky Healthcare. (2018). Pulmonology-Pediatric. Retrieved from:

<https://ukhealthcare.uky.edu/kentucky-childrens-hospital/services/pulmonology-pediatric#locations>

Vernon, J., Trujillo, A., Rosenbaum, S., DeBuono, B. (2008). Low Health Literacy: Implications for National Health Policy. Retrieved from:

[https://publichealth.gwu.edu/departments/healthpolicy/CHPR/downloads/LowHealthLiteracyReport10\\_4\\_07.pdf](https://publichealth.gwu.edu/departments/healthpolicy/CHPR/downloads/LowHealthLiteracyReport10_4_07.pdf)

Wood, M., Price, J., Dake, J., Telljohann, S., Khuder, S. (2010). African-American parents'/guardians' health literacy and self-efficacy and their child's level of asthma control. *Journal of Pediatric Nursing*. 25. 418-427.