

School of Dentistry  
Virginia Commonwealth University

This is to certify that the thesis prepared by Melissa Paige Fries, B.S., D.D.S., entitled  
FUNCTIONAL HEALTH LITERACY AND THE USE OF DENTAL SERVICES IN  
YOUNG CHILDREN has been approved by her committee as satisfactory completion of  
the thesis requirement for the degree of Master of Science in Dentistry

---

Tegwyn H. Brickhouse D.D.S., Ph.D., Thesis Director, Virginia Commonwealth University School of  
Dentistry

---

Henry J. Carretta Ph.D., M.P.H., Adjunct Professor, Virginia Commonwealth University School of  
Medicine

---

Michael D. Webb D.D.S., Graduate Program Director of Pediatric Dentistry, Virginia Commonwealth  
University School of Dentistry

---

John Unkel D.D.S., Chairman Department of Pediatric Dentistry, Virginia Commonwealth University  
School of Dentistry

---

Laurie C. Carter D.D.S., Ph.D., Director of Advanced Dental Education, Virginia Commonwealth  
University School of Dentistry

---

Dr. F. Douglas Boudinot, Dean of the Graduate School

April 15, 2009

© Melissa Paige Fries 2009

All Rights Reserved

FUNCTIONAL HEALTH LITERACY AND THE USE OF DENTAL SERVICES IN  
YOUNG CHILDREN

A thesis submitted in partial fulfillment of the requirements for the degree of Masters of  
Science in Dentistry at Virginia Commonwealth University.

by

MELISSA PAIGE FRIES  
B.S., Stetson University, 1999  
D.D.S., New York University College of Dentistry, 2003

Director: TEGWYN H. BRICKHOUSE D.D.S., PH.D.  
ASSOCIATE PROFESSOR, DEPARTMENT OF PEDIATRIC DENTISTRY

Virginia Commonwealth University  
Richmond, Virginia  
June 2009

## Acknowledgements

I would like to thank my research committee, Dr. Tegwyn Brickhouse, Dr. Henry Carretta, and Dr. Michael Webb. Their guidance and assistance was truly welcomed and much appreciated. Also, Dr. Bill Piscitelli, and my fellow residents for their encouragement and support while completing my research.

## Table of Contents

	Page
Acknowledgements .....	ii
List of Tables .....	iv
Chapter	
1. Introduction.....	1
2. Method and Materials.....	5
Design .....	5
Sample and Data Collection.....	5
Health Literacy Measures .....	5
Dental Utilization.....	7
Statistical Analysis.....	7
3. Results .....	9
4. Discussion .....	11
5. Conclusion.....	14
References .....	15

## List of Tables

	Page
Table 1: Life Skills Progression Scales and Associated Literacy Measures .....	18
Table 2: Demographic Characteristics. ....	19
Table 3: Health Literacy Scores .....	20
Table 4: Cohort Descriptors .....	21
Table 5: Bivariate Analysis for at least one dental visit.....	22
Table 6: Regression for at least one dental visit.....	23
Table 7: Bivariate Analysis for multiple dental visits.....	24
Table 8: Regression for multiple dental visits.....	25

## Abstract

### FUNCTIONAL HEALTH LITERACY AND THE USE OF DENTAL SERVICES IN YOUNG CHILDREN

By Melissa Paige Fries, B.S., D.D.S.

A thesis submitted in partial fulfillment of the requirements for the degree of Masters of Science in Dentistry at Virginia Commonwealth University.

Virginia Commonwealth University, 2009

Major Director: Tegwyn H. Brickhouse D.D.S., Ph.D  
Associate Professor, Department of Pediatric Dentistry

**Purpose:** The purpose of this study is to examine parental Functional Health Literacy and their child's subsequent utilization of dental services.

**Methods:** This was a prospective cohort study of children (n=1175) enrolled in the Child Health Investment Partnership of Virginia (CHIP). Descriptive statistics and separate multivariate logistic regressions were used to determine the relationship between functional health literacy measures; 1) Health Care Literacy (HCL), 2) Personal Health Literacy (PHL), and 3) LSP 22 scale, with utilization as measured as number of dental visit/s.

**Results:** Descriptive analysis of the cohort reveals: 45% black, 40% white, 10% Hispanic, 5% other, 41% of parents not having a high school diploma or GED, >75% were enrolled in CHIP by the age of one, 90% had Medicaid, 80% lived in Roanoke City, 87% had a normal birth weight, 86% were term pregnancies, and 91% did not have asthma. All literacy measures, PHL, HCL, LSP 22, and LSP 22 Target Range were positively associated with having dental utilization. Hispanic race had a less likely chance of having multiple dental visits even when within target range of LSP 22.

**Conclusion:** Parents of children enrolled in CHIP with higher levels of functional health literacy as measured by the Life Skills Progression Instrument demonstrated an increased likelihood of dental utilization for their children.

## INTRODUCTION

Dental caries is the most prevalent chronic disease of childhood. Significant disparities in oral health exist according to race, ethnicity, education, income and geography. Children from low-income families experience more dental disease and have reduced access to dental care resulting in fewer opportunities for prevention and higher levels of unmet dental treatment needs<sup>1,2</sup>. Health literacy is thought to be an important determinant of oral health that intersects with other factors (e.g., family attitudes, motivation) in numerous ways<sup>3</sup>. Literacy is not the only pathway to improving oral health outcomes, but is critical to the prevention of early childhood caries (ECC)<sup>4,5</sup>.

A definition for oral health literacy is “the degree to which individuals have the capacity to obtain, process, and understand basic oral health decisions”<sup>6</sup>. When applied to improved oral health outcomes, oral health literacy is important and can be included in any efforts aimed at impacting early childhood caries. Oral health literacy is a collection of skills that includes not just the ability to function in the health care system but also to act upon the education being provided from that system or within the family’s culture and community. The family must be able to then 1) visualize (e.g., read, watch, listen), 2) comprehend the material given, and 3) implement the desired actions (e.g., behavior, tooth brushing, feeding habits) as part of the child’s preventative health routine. Poor oral health literacy is associated with poorer perceptions of health, less utilization of services

(particularly prevention related), and poorer understanding of verbal and written instructions for self-care<sup>7</sup>.

The American Academy of Pediatric Dentistry's Clinical Guideline on Infant Oral Health calls for early risk assessment to identify parent-infant groups who are at higher risk for development of ECC<sup>8</sup>. Parental health literacy skills have been shown to have an effect on their child's health<sup>9</sup>. The hypothesis is that higher parental educational levels will translate into increased likelihood of preventive dental care for their child. For this reason, it is important to identify families with low oral health literacy skills as these children are most likely at risk for future decay and these parents are more likely to experience barriers to adequate education. Health care providers are challenged with appropriately and effectively educating families with children at risk for early childhood caries.

Recent studies have highlighted the significance of health literacy in both patient compliance and positive health outcomes<sup>3,9,10</sup>. Measures of health literacy are fairly new to oral health with only a few recently examined and applied to dental utilization and oral health outcomes. These studies have identified screening tools that can be used effectively in a primary care setting to identify parents of children with low functional literacy skills<sup>2</sup>. Two health literacy instruments used in medicine have been modified for oral health and pilot tested with parents of children receiving oral health services<sup>11</sup>. These dental literacy instruments appear to measure constructs that are different from the health literacy instruments. The Rapid Estimate of Adult Literacy in Dentistry (REALD) and the Test of Functional Health Literacy in Dentistry (TOFHLiD) have been demonstrated to be valid

constructs and reliable measures of oral health literacy in addition to being correlated with caregivers' perceived oral health quality of life and their child's oral health outcomes <sup>12, 13</sup>.

A unique tool that is used to measure functional health literacy is the Life Skills Progression Outcome tool. The Life Skills Progression (LSP) outcome tool goes beyond parental literacy and health outcomes and examines individual parent infant / toddler outcomes over time. It is a utilization-focused outcome evaluation tool for high-risk families with young children. It has been used in home health visitation programs and allows the provider to evaluate data from visits, screening tools, and observations <sup>14</sup>.

Currently, there is limited research on functional oral health literacy and its implications on children's oral health. As a whole the LSP consists of 43 scales that measure different constructs. These constructs are life skills that reflect a variety of basic skills needed to live and parent well. Each question is a likert-scale with numerical values between 1 and 5 (inadequate to competent), reflecting characteristics, development, and /or learning curve of the parent or child. The LSP also tracks the child's developmental and regulatory outcomes. This measurement tool is a useful summary of the functional health literacy in parents of young children <sup>14</sup>.

The LSP tool is being used by Child Health Investment Partnership of Roanoke Valley (CHIP of RV). It is a private-public funded home visitation program that provides social services and care coordination for at-risk children and their families. Home visitation programs became popular in the 1990s as way to bring services to young children of socially/geographically isolated families <sup>15</sup>.

CHIP promotes the health of children in Roanoke, Botetourt and Craig counties

from birth to entry into kindergarten, and who reside in families with income 185-200% below the poverty level of the service area. The program ensures comprehensive health care, strengthens families, and coordinates community resources<sup>15,16</sup>.

The purpose of this study is to examine the relationship between the functional health literacy of parent enrolled in CHIP as measured by the LSP and their child's utilization of dental services.

## **METHOD AND MATERIALS**

### **Design**

This was a prospective cohort study of children (n=1175) enrolled in the Child Health Investment Partnership of Virginia (CHIP). CHIP is a public/private partnership with the goal of ensuring comprehensive health care, strengthening families, and coordinating community resources for at-risk children. This study was approved for human subjects by the Virginia Commonwealth University Institutional Review Board.

### **Sample and data collection**

This was a secondary data analysis of enrollment data and clinical records of individual children enrolled in CHIP over a four year period (September 2004-September 2008). Each child was assigned a unique identification number that linked their demographic information, enrollment history, health literacy measures, and dental utilization over the study period.

### **Health Literacy Measures**

The child's caregiver completed the health literacy measure (LSP) at the time of enrollment into the CHIP program. The Life Skills Progression Outcome tool (LSP) was then used to create different measures of functional health literacy of the child's caregiver.

The score for each item of the LSP tool ranged, on a likert-scale, from 1 and 5. These functional health literacy measures with corresponding item descriptions and numerical values can be found in Table 1. Some values for the LSP items are 0 indicating that the question is not applicable, has no answer, or was not asked.

Two functional health literacy measures have been derived from the LSP. Health Care Literacy (HCL) and the Personal Health Literacy (PHL), have been used to rate a parents ability to function in the healthcare system and gauges the ability to function in health contexts at home, respectively <sup>17</sup>.

Health Care Literacy (HCL) is measured by the mean of 9 LSP items (at least 5 of the 9 items must be answered) that represent a mother's literacy for functioning in the healthcare system. The target range for functional HCL is 4 to 5 and indicates a parent capable of accessing and obtaining health services/benefits for herself and her child. A low functional HCL of 1 identifies a parent that has inadequate or inappropriate utilization of healthcare services. HCL is made up of LSP scales as noted in Table 1.

Level of functioning in health contexts at home is measured by the Personal Health Literacy (PHL). The PHL is a mean of at least four of seven items available (Table 1). A low PHL score indicates an inability to recognize need for healthcare services, benefits, and resources as well as indicating engagement in harmful health behaviors. A high PHL score is indicative of avoidance in harmful health behaviors and strong use of health resources <sup>17</sup>.

The LSP tool contained one item which was specifically related to functional dental literacy (LSP scale 22 child-dental). This item measures whether a child has a dental home,

seeks regular preventative care, seeks treatment for oral disease, and daily oral hygiene practices. Typically, this scale is only utilized after the child is six months of age due to presence of teeth. A score of 0 is given if child under the age of six months. The target range for LSP 22 (LSP 22 TR) is 3.5 or higher <sup>17</sup>.

### **Dental Utilization**

The **outcomes** of dental utilization included whether the child has a dental visit (yes/no), and the mean number of dental visits. A descriptive analysis was also completed for a number of factors related to health literacy and dental utilization such as: whether child had asthma or not; whether child had a very low birth weight, low birth weight, or normal birth weight; pre-term birth, race, gender, age in months at enrollment, length of enrollment in CHIP, parents education level, type of insurance, and locality in which child resides.

### **Statistical Analysis**

Bivariate analysis and multivariate logistic regression models were created for dental utilization. Bivariate analysis was used to determine the relationship between literacy scores / LSP 22 score and the likelihood of having a dental visit. Binomial regression models were built separately for each literacy scale (HCL, PHL, and LSP 22) to examine the relationship between health literacy scale (mean) and the likelihood of having dental visit. The models were adjusted to control for the effects of each covariate, such as: (1) race (white, Hispanic, other vs. black); (3) length of enrollment in days; (4) patient

gender (Female vs. Male); (5) asthma (yes vs. no); (6) age at enrollment (>1 year vs. <1 year); (7) birth weight (low birth weight/very low birth weight vs. normal); and (8) education level of parents (> high school diploma or GED, high school diploma or GED vs. less than high school diploma or GED). Statistical analysis completed using Stata SE Version 9.2, 2007.

## RESULTS

The descriptive analysis of the patient's race reveals the population to be 45% black, 40% white, 10% Hispanic, and 5% other, with a male:female ratio of 1:1. Over three-fourths of the patients were enrolled in CHIP by the age of one. The majority of patients had Medicaid insurance (90%), lived in Roanoke City (80%), had a normal birth weight (87%), were term pregnancies (86%), and did not have asthma (91%). In analyzing the parent's education, 41% of the parents did not have a High School Diploma or GED. Only 15% of the parents had education beyond a high school diploma or GED. These results are summarized in Tables 2-4. Entries in the data set were missing for various descriptors when this occurred the n for the various descriptor was decreased and the missing data was not used in further data analysis.

Bivariate analysis for patient's having at least one dental visit found a relationship with Health Care Literacy, Personal Health Literacy, LSP 22 - Dental Child, and LSP 22 - Dental Child within Target Range. All associations were significant ( $p < 0.001$ ). Bivariate analysis for the number of dental visits found significant associations ( $p < 0.001$ ) as well for the mean HCL, PHL, LSP 22, and LSP 22 with Target Range. Results of bivariate analysis are seen in Table 5 and Table 7.

According to the logistic regression for HCL and PHL, significant relationships were found in addition to: children enrolled after 12 months of age and children having

asthma were more likely to have a dental visit. Logistic regression for the mean LSP 22 and LSP 22 in Target Range were significant. Children with higher mean LSP 22 and in the Target Range had an increased likelihood of a dental visit, as well as children enrolled after 12 months of age. See Table 6 for Results.

The HCL and PHL results from the negative binomial regressions for mean HCL and PHL found significant positive associations for increased dental utilization. Other significant factors positively associated with dental utilization were: white race, having asthma, and being enrolled in CHIP after 12 months of age. Furthermore, the negative binomial regressions for LSP 22 mean and LSP 22 Target Range (yes/no) found significant positive associations for increased dental utilization. Significant factors also related to dental utilization in these models were; having asthma, and being enrolled after 12 months of age. In those regressions, Hispanic children were more likely to have decreased dental utilization. Table 8 summarizes the separate negative binomial results for mean number of dental visits.

## DISCUSSION

In terms of Health Care Literacy (HCL), which is the parents ability to function in the healthcare setting, this research shows that caregiver's with higher mean HCL scores, are more likely to have at least one dental visit. Those children are also more likely to have an increased number of dental visits. Higher HCL mean scores, while holding the other variable constant in the model, are expected to have an increased utilization rate of 1.589 times. So parents who have an increased HCL score, are by functional literacy definitions better able to function in healthcare setting, i.e. access and utilize services. Interestingly, children with asthma were more likely to have a dental visit. This may be due to having a significant need for medical services, hence possibly more likely to utilize other aspects of the health care system as well. Children enrolled after age one were more likely as well, possibly because having an increased demand for healthcare already. Personal Health Literacy also had an increased rate of dental utilization (IRR 1.619 95% CI: (1.345, 1.949)). PHL is an indicator of how a mother functions at home in maintaining and promoting child health, and in this study there is a relationship to dental utilization, implying that improved oral health at home has a relationship with dental visits. Hence, competency at home may lead to more dental utilization for maintenance and prevention.

The LSP 22 scale is the only LSP scale to relate to functional dental literacy for the child. The target range of over 3.5 is desired which indicates the child has a dental home,

has had some preventative care, and seeks timely treatment. Results from this study show that a higher mean LSP 22 score is significant for being more likely to have a dental visit in addition to being enrolled after 12 months of age. Naturally, this is because this is what the scale measures and gives face validity to the measurement scale. If a child has a high LSP score it means they have a dental home, hence have had a dental visit. Children that are within the target range of LSP 22 are associated also with enrolled after age 1 for having at least one dental visit. Again, the scale itself measures these associations and is easily explained. Having asthma, and being enrolled after 12 months also had increased levels of dental utilization. These findings may indicate again that having experience in an area of healthcare makes one more likely to have an experience in another area, such as dentistry. This would help explain our asthma relationship. This was not true of Hispanic race in both LSP 22 and LSP TR regressions where there was a decreased rate of dental utilization. In this study, baseline LSP data is examined in relationship to utilization. The LSP 22 scale and LSP TR will be more useful when used in future research examining improvements in scores with improvements in function in relationship to outcomes and utilization.

One disadvantage in this study was that the functional literacy items used to examine the relationship between functional literacy and dental utilization are newly proposed and there has been limited work published about them. This being said, the preliminary results when applied to dental utilization show many positive findings in this study. Future research in functional health literacy can be applied to healthcare utilization across the board and would validate our findings further. It would also be beneficial to

look at using the HCL and PHL in a longitudinal study over time in relation to dental utilization because this study only examined baseline literacy scores in relation to dental utilization. Another possible limitation of this study is that our dental utilization was recorded by the CHIP program. The examination of actual Medicaid claims may provide a better estimation of dental utilization. It would be interesting to see improvements in literacy scores over time with improvements in dental utilization. Furthermore, it would be beneficial to compare functional health literacy and actual dental claims and examine types of dental services.

## **CONCLUSIONS**

The aim of this study is to examine the relationship between functional health literacy for parent of children enrolled in CHIP of Roanoke Valley and their dental utilization. The LSP tool was developed with the intention of measuring functional health literacy over time. Preliminary findings indicate that maternal health literacy improves over time with home visitation <sup>14</sup>. This study demonstrates several associations between the functional health literacy measures and dental utilization in a home visitation program. In the future it is proposed that these associations will continue when examined over time and in relationship to dental outcomes and utilization.

## **Literature Cited**

### Literature Cited

1. Vargas, C. M., Crall, J. J., & Schneider, D. A. (1998). Sociodemographic distribution of pediatric dental caries: NHANES III, 1988-1994. *J Am Dent Assoc*, 129(9), 1229-1238.
2. Bennett, I. M., Robbins, S., Al-Shamali, N., & Haecker, T. (2003). Screening for low literacy among adult caregivers of pediatric patients. *Family Medicine*, 35(8), 585-590.
3. National Institute of Dental and Craniofacial Research. (2005). The invisible barrier: Literacy and its relationship with oral health. *Journal of Public Health Dentistry*, 65, 174-174-82.
4. Horowitz, A. M., & Kleinman, D. V. (2008). Oral health literacy: The new imperative to better oral health. *Dental Clinics of North America*, 52(2), 333-44, vi.
5. Rudd, R. E., & Horowitz, A. M. (2005). Health and literacy: Supporting the oral health research agenda. *Journal of Public Health Dentistry*, 65(3), 131-132.
6. American Dental Association. *ADA resolution 13H-2006*. Retrieved 06/07, 2008, from [www.ada.org/prof/resources/pubs/adanews/adanewsarticle.asp?articleid=2236](http://www.ada.org/prof/resources/pubs/adanews/adanewsarticle.asp?articleid=2236).
7. Jackson, R. (2006). Parental health literacy and children's dental health: Implications for the future. *Pediatric Dentistry*, 28 (1), 72-75.
8. American Academy of Pediatric Dentistry. (2006). Guideline on infant oral health care. Pediatric Dentistry Reference Manual 2006-2007. *Pediatric Dentistry*, 28(7), 73-76.
9. Dewalt, D. A., Berkman, N. D., Sheridan, S., Lohr, K. N., & Pignone, M. P. (2004). Literacy and health outcomes: A systematic review of the literature. *Journal of General Internal Medicine: Official Journal of the Society for Research and Education in Primary Care Internal Medicine*, 19(12), 1228-1239.

10. Institute of Medicine. (2004). *Health literacy: A prescription to end confusion*. Washington, DC: National Academies Press.
11. Lee, J. Y., Rozier, R. G., Lee, S. Y., Bender, D., & Ruiz, R. E. (2007). Development of a word recognition instrument to test health literacy in dentistry: The REALD-30-- A brief communication. *Journal of Public Health Dentistry*, 67(2), 94-98.
12. Gong, D. A., Lee, J. Y., Rozier, R. G., Pahel, B. T., Richman, J. A., & Vann, W. F., Jr. (2007). Development and testing of the Test of Functional Health Literacy in Dentistry (TOFHLiD). *Journal of Public Health Dentistry*, 67(2), 105-112.
13. Richman, J. A., Lee, J. Y., Rozier, R. G., Gong, D. A., Pahel, B. T., & Vann, W. F., Jr. (2007). Evaluation of a word recognition instrument to test health literacy in dentistry: The REALD-99. *Journal of Public Health Dentistry*, 67(2), 99-104.
14. Wollesen, L., & Peifer, K. (2006). *Life skills progression LSP: An outcome and intervention planning instrument for use with families at risk*. Baltimore, Md.: Paul H. Brookes Pub. Co.
15. The role of home-visitation programs in improving health outcomes for children and families. American Academy of Pediatrics. Council on Child and Adolescent Health.(1998). *Pediatrics*, 101(3 Pt 1), 486-489.
16. American Academy of Pediatric Dentistry. (2007). Policy on the dental home. Pediatric dentistry reference manual 2007-2008. *Pediatric Dentistry*, 29 (7), 22-23.
17. Smith, S. (2008). *Beginnings guides health literacy library*. Retrieved 05/01, 2009, from <http://www.guidesforbeginnings.com/index.html> .

Table 1: Life Skills Progression Scales and Associated Literacy Measures (N= 1175)

	LSP #	MEASURE						Mean	
			0	1	2	3	4		5
PERSONAL HEALTH LITERACY	LSP 4	Attitudes toward Current Pregnancy	N/A	Unplanned & unwanted. Abortion or adoption plan.	Unplanned; ambivalent, fearful; coerced to keep.	Unplanned & accepted	Planned but unprepared.	Planned, prepared, welcomed.	0.3
	LSP 7	Support of Development	N/A	Poor knowledge of child development; Unrealistic expectations; Ignores or refuses information.	Little knowledge of child development; Limited interest in development; Passive parental role.	Open to child development information. Provides some toys, books & play for age.	Applies child development ideas. Interested in child's development, skills, interests & play.	Anticipates child's developmental changes. Uses appropriate toys & books; Plays / reads with child daily.	3.5
	LSP 8	Safety	N/A	Hospitalized for treatment of unintentional injury; Has permanent damage.	Outpatient / ER treatment of unintentional injury; no permanent damage.	No unintentional injury; Home / car unsafe; Not childproofed.	No unintentional injury. Home partially safe. Uses car seat; Uses information.	Child protected; no injury; Home/car safe; Teaches safety; seeks/uses information for age.	4.0
	LSP 11	Use of Resources	N/A	Resource needs unrecognized; Community resources not used or refused; Hostile	Resource needs unrecognized; Limited use when assisted by others. Misses most appointments.	Accepts help to identify needs; Uses resources when assisted by others; Keeps some appointments.	Identifies needs; Uses resources with little assistance; Keeps most appointments.	Identifies needs; Uses resources independently; Keeps or reschedules appointments.	3.7
	LSP 24	Substance Use or Abuse (Drugs &/or alcohol)	N/A	Chronic history drug &/or alcohol abuse with addiction.	Drug / alcohol binge or intermittent use, without apparent addiction.	Rare or experimental use of drugs or clean; In recovery group or treatment program.	Occasional use of legal substances; Stops if pregnant.	No history or current use / abuse.	4.3
	LSP 25	Tobacco	N/A	Chain smokes; > 2 packs/day; Uses smokeless; Heavy 2nd hand exposure.	Non-chain use or some 2nd hand exposure.	Decreases # when pregnant; Controls 2nd hand exposure.	No use or 2nd hand exposure in past 6 months or this pregnancy.	None or never.	3.9
	LSP 28	Self Esteem	N/A	Poor; Critical of self; Anticipates criticism from others; Rarely initiates; Avoids trying new skills.	Copes sometimes; but with limited confidence & flat affect; Limited initiative for learning new skills.	Irritable/defensive; Makes excuses, blames others; Initiates/starts new skills but gives up easily.	Beginning to actively initiate; Develops skills & recognizes own competence; Emerging confidence visible.	Confident in skill & ability to learn; Expresses pride in achievements & successes.	4.0
HEALTH CARE LITERACY	LSP 10	Use of Information	N/A	Refuses information from home visit or health care.	Uses inaccurate information from informal sources.	Passively accepts some information from home visit and health care.	Accepts / uses most information from home visit or health care.	Actively seeks/ uses information from home visit, health care and other sources.	3.8
	LSP 17	Maternal - Prenatal Care	N/A	No prenatal care.	Care starts 2nd -3rd trimester; Keeps some appointments.	Care starts 2nd -3rd trimester; Keeps most appointments.	Care starts in 1st trimester; Keeps most appointments.	Keeps post-partum appointment.	0.8
	LSP 18	Maternal - Sick Care	N/A	Acute / chronic conditions go without diagnosis / treatment; No medical home.	Seeks care only when very ill; Uses ER for care; No medical home.	Seeks care inconsistently; Inconsistent treatment follow-up; Unstable medical home.	Seeks care appropriately; Follows treatment recommended; Has medical home.	Seeks care appropriately; Cure or control obtained; Has medical home.	2.9
	LSP 19	Maternal - Family Planning	N/A	No family planning method used; Lacks information regarding family planning.	Family planning method use rare; Limited understanding of family planning.	Occasional use of family planning methods; Some understanding of family planning methods.	Regular use of family planning methods; Good understanding of family planning methods.	Regular use of family planning methods; Plans / spaces pregnancies.	3.4
	LSP 33	Medical Health Insurance	N/A	None / unable to afford care or coverage.	Medicaid for pregnant or emergency only.	Medicaid full scope benefits with or without share of cost.	State subsidized or partial pay coverage.	Private insurance with or without co-pay for self / others.	2.4
	LSP 20	Child - Preventive Well Care	N/A	None; No medical home.	Seldom; No medical home.	Occasional appointment; Unstable medical home.	Has annual exam only; Has stable medical home.	Keeps regular CHDP / well child appointments with same provider.	4.4
	LSP 21	Child - Sick Care	N/A	Medical neglect; No diagnosis / treatment for acute or chronic conditions.	Has care only when very ill; Uses ER for care.	Timely care minor illness but inconsistent treatment / follow-up.	Timely care minor illness; Follows treatment recommended.	Obtains optimal care / control for acute or chronic conditions.	4.2
	LSP 22	Child - Dental	N/A	No dental home or care with serious ECC; Poor hygiene.	No dental home or care with some ECC and inadequate treatment / hygiene.	Has dental home & hygiene but late treatment of ECC	Has dental home; Some preventive care / timely treatment.	Has dental home; Regular preventive care & timely treatment.	2.6
	LSP 23	Child - Immunizations	N/A	None or refused.	Immunization history uncertain; Records lost.	Immunizations begun, but no return appointment.	Immunizations delayed, has return appointment.	Complete or up-to-date.	4.6

Table 2: Demographic Characteristics

DESCRIPTORS		%	Frequency	N
<b>Gender</b>	Male	51	604	1173
	Female	49	569	1173
<b>Race</b>	Black	45	524	1172
	White	40	468	1172
	Hispanic	10	117	1172
	Other	5	63	1172
<b>Asthma</b>	Yes	9	1074	1175
	No	91	101	1175
<b>Locality</b>	Botetourt County	2	18	1175
	Craig County	5	54	1175
	Roanoke City	80	943	1175
	Roanoke County	8	96	1175
	Salem City	5	64	1175
<b>Birth weight</b>	Normal weight	87	876	1008
	Low (<2500 gm )	11	108	1008
	Very Low (<1500 gm )	2	24	1008
<b>Parents education</b>	< High school diploma or GED	41	465	1127
	High School diploma or GED	43	485	1127
	> High School diploma or GED	16	177	1127
<b>Insurance</b>	Medicaid	90	1052	1175
	Private	9	108	1175
	none	1	15	1175
<b>Pregnancy Term</b>	>36 weeks	14	139	1006
	<36 weeks	86	867	1006
<b>Age at enrollment</b>	< 12 months	80	937	1175
	>12 months	20	238	1175

Table 3: Health Literacy Scores

<b>SCORES</b>	<b>N</b>	<b>MEAN</b>	<b>STD DEV</b>	<b>MIN</b>	<b>MAX</b>
Health Care Literacy	1149	3.9	0.5	1.6	5.0
Personal Health Literacy	1154	4.0	0.6	2	5.0
LSP 22	1175	2.6	1.9	0	5.0

Table 4: Cohort Descriptors

<b>COHORT DESCRIPTORS</b>	<b>N</b>	<b>MEAN</b>	<b>STD DEV</b>	<b>MIN</b>	<b>MAX</b>
Total Number of Well Child Visits	1175	5.6	2.9	0	24.00
Total # dental visits	1175	0.9	1.4	0	10.00
At least one Treatment visit	1175	0	0.2	0	1.00
Total number of Dental treatment visits	1175	0.1	0.3	0	3.00
At least one Maintenance visit	1175	0.4	0.5	0	1.00
Total number of dental maintenance visits	1175	0.7	1.2	0	10.00
Total Number of F Varnish Visits	1175	0.6	0.8	0	3.00
Age at enrollment (months)	1175	6.7	8.9	0	36.00
Length of enrollment (days)	1175	955.9	590.7	98	2794.00

Table 5: Bivariate Analysis for at least one dental visit

<b>BIVARIATE ANALYSIS FOR AT LEAST 1 DENTAL VISIT</b>			
	<b>p-value</b>	<b>Odds Ratio (95% CI)</b>	<b>N</b>
<b>HCL</b>	0.000	1.608 (1.278, 2.024)	1149
<b>PHL</b>	0.000	1.481(1.198,1.830)	1154
<b>LSP 22</b>	0.000	1.511 (1.337, 1.707)	1175
<b>LSP 22 TARGET RANGE</b>	0.000	2.079 (1.573, 2.749)	1175

Table 6: Regression for At Least One Dental Visit

<b>REGRESSION FOR AT LEAST ONE DENTAL VISIT</b>			
	<b>Intercept*</b>	<b>p-value</b>	<b>Odds Ratio (95% CI)</b>
<b>HEALTH CARE LITERACY</b>	HCL Mean	0.021	1.355 (1.046, 1.754)
	Asthma		
	asthma	0.008	1.805 (1.168, 2.787)
	no asthma (ref)		1
	Enrollment age		
>12 months	0.000	3.943 (2.827, 5.500)	
<12 months (ref)		1	
<b>PERSONAL HEALTH LITERACY</b>	PHL MEAN	0.006	1.406 (1.101, 1.796)
	Enrollment age		
	> 12 months	0.000	3.986 (2.854, 5.566)
	<12 months (ref)		1
	Asthma		
asthma	0.003	1.947 (1.257, 3.015)	
no asthma (ref)		1	
<b>LSP 22</b>	LSP 22	0.000	1.439 (1.257, 1.648)
	Enrollment age		
	<12 months	0.000	3.196 (2.200, 4.643)
	>12 months (ref)		1
	LSP 22 TARGET RANGE	0.000	2.009 (1.475, 2.736)
Enrollment age			
>12 months	0.000	3.085 (2.136, 4.455)	
<12 months (ref)		1	

\* Also controlled for race, gender, parents education level, and low birth weight.

Table 7: Bivariate Analysis for more than One Dental Visit

<b>BIVARIATE ANALYSIS FOR CONTINUOUS DENTAL VISITS</b>				
	<b>Coefficient</b>	<b>p-value</b>	<b>95% CI</b>	<b>N</b>
<b>HCL Mean</b>	0.569	0.000	0.377, 0.760	1149
<b>PHL MEAN</b>	0.366	0.000	0.184, 0.548	1154
<b>LSP 22</b>	0.371	0.000	0.283, 0.460	851
<b>LSP 22 TARGET RANGE</b>	0.715	0.000	0.519, 0.911	851

Table 8: Regression for mean number of dental visits

	<b>Intercept</b>	<b>IRR</b>	<b>P-VALUE</b>	<b>95% CI</b>
<b>HEALTH CARE LITERACY</b>	HCL Mean	1.589	0.000	1.269, 1.989
	Race			
	white	1.283	0.018	1.043, 1.579
	black (ref)			
	Asthma			
	asthma	2.032	0.000	1.569, 2.632
	no asthma (ref)			
Enrollment age				
<12 months (ref)				
>12 months	2.011	0.000	1.656, 2.443	
<b>PERSONAL HEALTH LITERACY</b>	PHL MEAN	1.619	0.000	1.345, 1.949
	Race			
	white	1.449	0.000	1.178, 1.781
	black (ref)			
	Asthma			
	asthma	2.127	0.000	1.643, 2.754
	no asthma (ref)			
Enrollment age				
<12 months (ref)				
>12 months	1.974	0.000	1.627, 2.395	
<b>LSP 22 - DENTAL CHILD</b>	<b>LSP 22</b>	1.454	0.000	1.328, 1.592
	Race			
	<i>Hispanic</i>	0.617	0.019	0.412, 0.924
	black (ref)			
	Asthma			
	asthma	1.635	0.000	1.287, 2.076
	no asthma (ref)			
	Enrollment age			
	<12 months (ref)			
	>12 months	1.603	0.000	1.326, 1.937
	<b>LSP 22 TARGET RANGE</b>	2.193	0.000	1.781, 2.699
	Race			
	white	1.229	0.038	1.012, 1.492
<i>Hispanic</i>	0.643	0.025	0.437, 0.946	
black (ref)				
Asthma				
Asthma	1.662	0.000	1.308, 2.111	
no asthma (ref)				
Enrollment age				
<12 months (ref)				
>12 months	1.573	0.000	1.301, 1.903	

\* Also controlled for race, gender, parents education level, length of enrollment, and low birth weight.

## VITA

Melissa Paige Fries was born on November 25, 1976 in Waukesha, Wisconsin. She graduated from Stetson University in 1999, and received her Bachelor of Science in Biochemistry. Dr. Fries received her Doctor of Dental Surgery from New York University College of Dentistry in 2003. In May that same year she was commissioned Lieutenant in the United States Navy Dental Corps and stationed in Bethesda, Maryland. She completed a General Practice Residency at the National Naval Medical Center in June 2004. In 2006, Dr. Fries was awarded a Fellowship Award by the Academy of General Dentistry.