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# Oral Health Literacy and Oral Hygiene Habits in a Kentucky Appalachian Community

Katie D. Schill  
*Walden University*

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# Walden University

College of Health Sciences

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Katie Schill

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2019

Abstract

Oral Health Literacy and Oral Hygiene Habits in a Kentucky Appalachian Community

by

Katie Schill

BA, Eastern Kentucky University, 2009

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy in Public Health, Epidemiology Specialization

Walden University

May 2019

## Abstract

This study sought to identify the level of oral health literacy held by people who live in transitional and distressed Kentucky Appalachian areas and if this effects how often they are using oral hygiene techniques. Data were also collected to describe the attitudes Kentucky Appalachian adults hold toward oral hygiene and oral health status. Current documentation shows that poor oral health remains a public health threat in this population despite efforts such as school-based sealant programs and increased dental insurance coverage. This study followed a quantitative design and 99 participants were polled using a survey specifically developed for this study's use. Composite median scores and Spearman's correlation values established the existence of a low oral health literacy level across the participant pool, an also documented that oral hygiene techniques are not used in frequencies recommended for proper oral health. A poor self-efficacy towards the ability to utilize these techniques properly was also identified. Using the Mann-Whitney U test, responses were compared based on county designation and few significant differences were found. These findings show that oral health status and related beliefs are similar across the region and not just isolated to the economically poorest areas as the currently available literature suggests. Applying the health belief model it is predicted that Kentucky Appalachians are unlikely to adopt proper oral hygiene habits until their self-efficacy is improved. A recommendation of this study is that public health officials should promote personal control when designing public health programs geared towards improving the oral health status of this population. To do so would introduce a positive social change in that people with good oral health are less likely to experience the pain, malnutrition, and negative social stigma that is associated with poor oral health.

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## Chapter 1: Introduction to the Study

### Introduction

Traditionally the Appalachian population has demonstrated a lower level of functional health literacy when compared to their non-Appalachian counterparts (Hutson, Dorgan, Phillips, & Behringer, 2007; Ludke, Obermiller, Jacobson, Shaw, & Wells, 2006). Along with this lower health literacy level, the Appalachian population experiences a higher rate of health disparities across many chronic disease conditions (Ludke & Obermiller, 2016). These health disparities also include a substandard level of oral health, which is a trend demonstrated by Kentucky's population that has elevated rates of dental decay especially concentrated in its vast Appalachian population (Dawkins et al., 2013; Ludke & Obermiller, 2016; Saman, Johnson, Arevalo, & Odoi, 2011).

Poor oral health not only causes a variety of dental diseases but is also associated as a risk-factor for many other chronic diseases as well as being recognized as a cofactor by increasing the chance that an existing chronic disease will worsen in its intensity (Cullinan, Ford, & Seymour, 2009; National Heart, Lung, and Blood Institute, 2016). Along with influencing physical conditions, poor oral health has also been established as negatively affecting mental health in terms of such aspects as self-esteem, school and job performance, and social interactions (Sischo & Broder, 2011). Despite high rates of fluoridated water supplies and school-based sealant programs, Kentucky is continuously ranked among the highest in the nation for poor oral health indices (Saman et al., 2011). The 2012 Behavioral Risk Factor Surveillance System (BRFSS) indicated that 51.5% of Kentucky adults over the age of 65 years have had six or more permanent teeth removed,

compared to the U.S. national rate of 39.6% (Oral Health in Kentucky Technical Report, 2016). The BRFSS also demonstrated that tooth loss in Kentucky adults displayed regional based trends. Kentuckians located in the eastern-most Appalachian areas reported above state-level rates of tooth loss. Dental disease is not just found in Appalachian adults: children also display dental complications, with Kentucky again ranked among the highest in the nation for the prevalence of childhood dental caries. These data indicate a cycle of poor dental health that is being passed from generation to generation.

Currently accepted and documented reasons for the increased rates of dental decay in Kentucky Appalachians include lower access to dental health professionals or clinics, as well as a decreased access to dental insurance as compared to non-Appalachians (Dawkins et al., 2013; Krause, May, Lane, Cossman, & Konrad, 2012). However, little to no documentation can be found that examines the oral hygiene habits of Kentucky Appalachian adults and their children. Oral hygiene habits such as brushing teeth and flossing are documented as being an integral part in preventing most cases of dental decay and so are very important to the overall status of oral health (Van der Weijden & Slot, 2010).

This study will evaluate for a relationship between level of oral health literacy and the frequency of oral hygiene techniques used by caregiver's and their dependent children located in a Kentucky Appalachian community. If such a relationship can be established, this could indicate that specialized educational efforts featuring oral hygiene habits may assist in improving the oral health status of this population. The perceptions and attitudes

held towards good oral health, as well as poor oral health, will also be measured. By documenting the beliefs held by caregiver's towards oral health, this could provide insight into an area that needs targeting by public health efforts to improve the local understanding of dental disease and its associated health risks.

## **Background**

### **Research Literature Summary**

The concept of health literacy is used to describe how well a person processes and understands health related information (Nutbeam, 2008). Having a poor level of health literacy is often indicative of having an overall poor health status and poorer health outcomes, while those who demonstrate higher levels of health literacy usually have more positive health statuses and outcomes (Nutbeam, 2008). Nielsen-Bohlman, Panzer, and Kindig acknowledged that this relationship between health literacy level and overall health status has now become a recognized and essential component of health care (as cited by Vann, Lee, Baker, & Divaris, 2010, p.1395). Similar to health literacy, the term oral health literacy has recently developed to describe a person's ability to obtain, process, and understand information that pertains to dental health and so is considered to be a part of a person's overall level of health literacy (Vann et al., 2010).

Despite the acceptance of health literacy as a part of a successful health care plan, an estimated 80 million adults across the United States are believed to have limited health literacy levels (Berkman, Sheriadan, Donahue, Halpern, & Crotty, 2011). Having low health literacy may place these people at an increased risk of poor health status and outcomes (Berkman et al., 2011). Certain groups and populations demonstrate higher

rates of low health literacy. These groups include those with a low socioeconomic status and those who have less than a high school education and both of these factors are found in abundance across the Kentucky Appalachian region (Berkman et al., 2011; Borak, Salipante-Zaidel, Slade, & Fields, 2012; Elam, 2002). In addition to these shared indicative factors, Ludke et al. (2006) documented that Kentucky Appalachians are significantly more likely to have a lower level of health literacy when compared to their non-Appalachian counterparts, which suggests that oral health literacy may follow the same subpar pattern.

Kentucky continuously ranks among the highest nationally for edentate adults amid reports of 13% of the adult population being completely toothless and increasing up to 40% across some Appalachia areas for those of retirement age (Dawkins et al., 2013; National Institute of Dental and Craniofacial Research, 2009). It is estimated that among Kentucky children, almost 50% suffer from an average of two untreated dental caries, with severity increased among children living in the most eastern areas, which are part of the Appalachian region (Dawkins et al., 2013).

### **Gap in Knowledge**

Although it is established that Kentucky Appalachians do suffer from a lower level of health literacy (Ludke et al., 2006; Moser et al., 2015), there is little to no documentation that investigates for a relationship between low oral health literacy and the overall poor dental health status that this population is suffering from. There is also little to no documentation investigating how self-oral hygiene techniques are used in the Kentucky Appalachian population although research shows that self-oral hygiene

techniques such as teeth brushing are imperative to good oral health (Van der Weijden & Slot, 2010). The study presented here will address this gap by evaluating for a relationship between the oral health literacy level and how frequently oral hygiene techniques are utilized in a Kentucky Appalachian population. Additionally, these Kentucky Appalachian adults will be polled on their beliefs regarding the personal risk poor oral health poses to them and their children, as well as their opinions and attitudes towards oral hygiene techniques.

### **Need for Study**

Historically accepted reasons for the poor oral health status in the Kentucky Appalachian region have included a lack of dental insurance coverage as well as decreased access to dental care professionals (Oral Health in Kentucky Technical Report, 2016). With the introduction of the Affordable Care Act as well as a Kentucky Medicaid expansion program, over 100,000 more Kentuckians sought and received dental services in 2014 than in 2013, indicating that with additional dental coverage now in effect, more people are seeking to utilize these benefits (Oral Health in Kentucky Technical Report, 2016). However, this represents not even a fifth of the some 560,000 people who were newly enrolled for Medicaid benefits during this time according to the Centers for Medicare and Medicaid Services (as cited by Oral Health in Kentucky Technical Report, 2016). Certain areas of Kentucky have limited or no access to dental services as dental professionals are more likely to cluster around more urban locations that have a higher average socioeconomic status as these areas offer a potentially higher income (Saman, Arevalo, & Johnson, 2011). This leaves the more rural areas in Appalachia underserved



or in some cases, with no dental professional service access as these areas have a lower average socioeconomic status and so offer a potentially lower income for dental professionals.

In 2010, the Kentucky Department for Public Health had issued recommendations to improve dental professional coverage. These included improving recruitment of dental students to areas of greater need and investigating the establishment of a dental school located in the mountainous Appalachian region of Kentucky (Kentucky Department of Public Health, 2010). To date, the ratio of dentists to patients in Kentucky rose from 5.6 per 10,000 population in 2006 to 6.0 dentists per 100,000 in 2015 (Kentucky Department of Public Health, 2010; Oral Health in Kentucky Technical Report, 2016). However, the pattern of unequal coverage still exists and some areas continue to go without any dental professional access.

By investigating for a relationship between oral health literacy level and oral hygiene habits, as well as evaluating for the attitudes towards oral health in the Appalachian population, this could give public health officials insight into how Kentucky Appalachians currently process and understand oral health information. The results may suggest a need for interventions regarding proper oral hygiene habits as in some areas these techniques may be the main source of currently available dental decay prevention. Evaluating for the attitudes held by Appalachian caregiver's towards dental disease and oral hygiene habits in children will also be valuable information to obtain. This will give insight into how parents and guardians are passing oral hygiene information and habits to children as documentation shows that children largely learn health behaviors and

attitudes from their parents and guardians (Rhee, 2008). This is especially true of preschool aged children as they depend solely on their caregiver for all health related treatment and attention. By investigating the information regarding oral health that is being passed from adult to child, opportunity may be found to improve the transition of knowledge which may in turn help to break the cycle of poor oral health that is occurring in the Kentucky Appalachian region.

### **Problem Statement**

Despite increased dental insurance coverage as provided by a Kentucky Medicaid expansion and an increase in the number of practicing dental health professionals, poor dental health remains a severe public health threat especially in the more rural Appalachian areas (Kentucky Department of Public Health, 2010; Oral Health in Kentucky Technical Report, 2016). Dawkins et al. (2013) found that 49.7% of the school-aged children included in their cross-sectional study suffered from an average of two untreated dental caries. This is 16% higher than the estimated 33% national rate of untreated dental caries in school-aged children, indicating that Kentuckians have an increased rate of developing this health risk (Kandel, Richards, & Binkley, 2012). Having poor childhood oral health increases the risk of having poor oral health as an adult, which is a trend seen in Appalachia with some areas reporting upwards of 40% of their 65 and older population being edentate (Dawkins et al., 2013; National Institute of Dental and Craniofacial Research, 2009).

Current preventative efforts in decreasing the rate of dental decay occurrence in Kentucky Appalachian children include the use of early grade school-based sealant

programs (Dawkins et al., 2013). To provide maximum benefit, sealants require routine inspection and repair from an oral health professional. This leaves many children in Appalachian areas where dental care access is low at increased risk of poor protection (National Institute of Dental and Craniofacial Research, 2012; Reed, 2016). Sealants wear away over time which may place children at increasing risk of dental decay onset as they age (National Institute of Dental and Craniofacial Research, 2012). Sealants also do not promote the use of proper oral hygiene habits, which are arguably the most important aspects in dental decay prevention (Kidd, 2011). With no long-term benefits or education regarding proper oral hygiene habits, the school-based sealant programs may only be prolonging the onset of dental decay in Kentucky children. There is also evidence that children are presenting to participate in sealant programs who already are suffering from moderate to severe dental decay (Dawkins et al., 2013). This indicates that poor oral health is occurring in preschool aged children, making it impossible for school-based sealant programs to target and assist in preventing dental decay in these cases. Being too young to do so for themselves, preschool aged children are dependent on their caregiver's for decisions regarding their oral health (Talekar, Rozier, Slade, & Ennett, 2005). Dye, Vargas, Lee, Magder, and Tinanoff (2011) demonstrated that there is a strong relationship between a mother's oral health status and that of her dependent children. Dye et al. (2011) found that mother's with untreated caries were three times more likely to have preschool aged children who also had caries when compared to children whose mother's did not have caries. This suggests that caretakers of preschool aged children who have a higher level of oral health literacy are more likely to have children who do

not suffer from dental decay or untreated dental caries. With this documented link between parent and child oral health status, it becomes clear that it is important to evaluate for the beliefs, attitudes, and habits that parents hold towards oral health as they may be passing negative habits and ideologies to their children. These aspects need to be investigated and documented in Kentucky Appalachian parents to give public health officials possible new venues of intervention. This is important as sealant programs, increased state based dental insurance, and a rise in available dentists are thus far not decreasing the rate of dental decay in this population.

### **Purpose of Study**

The purpose of this study is to determine if there is a relationship between the level of oral health literacy in Appalachian adults and the use of oral hygiene techniques both in themselves and their dependent children. This will be done by comparing how important Appalachian adults feel dental health is to how often they practice and enforce oral hygiene techniques in the home. Sequentially, this study will also provide a description of the current oral hygiene habits of Kentucky Appalachians of which there is little to no current documentation available. This study will also explore the extent to which Kentucky Appalachian adults feel they are in control of their own dental health, or if they feel the only way to have proper dental health is solely by obtaining treatment by a dental professional.

### **Independent Variable**

The independent variable in this study is the level of oral health literacy expressed by the Appalachian adult participants.

## **Dependent Variables**

Two dependent variables in this study are the frequencies that caregiver's use oral health hygiene techniques personally and how often they enforce the use of these techniques in their dependent children. Both frequencies will be evaluated with the independent variable to identify any trends in the data. This evaluation is important as it will show if caregivers with a higher level of expressed oral health literacy are utilizing oral hygiene methods more often than the caregivers with a lower level of expressed oral health literacy. The two groups of frequencies will then be compared to each other to determine the existence of any differences in the rate of use of oral hygiene techniques between caregiver's and children. This comparison will serve to display if caregivers are enforcing the use of oral health hygiene methods in their dependent children at higher rates than they are personally using them. If no difference in rates is identified, this may suggest that caregivers are passing their own oral health habits on to their children. This would provide evidence that supports the theory that poor dental health is a cycle being passed on from generation to generation.

Another dependent variable in this study is the extent to which the participants feel that they are in control of their own dental health status and that of their dependent children. The reported level of control will be compared to the independent variable of expressed oral health literacy level in order to identify any trends or correlations between the two variables.

The final dependent variable of this presented study is the perceived importance of oral hygiene methods. The level of importance that each participant feels towards oral

hygiene methods both in themselves and in their children will be recorded and compared with their expressed level of oral health literacy to determine if any trends exist in the collected data. This information will also provide an overview as to how the included Appalachian population currently feels towards oral hygiene methods.

### **Predictor Variable**

This study will record if participants or their dependent children have ever had a dental cavity. This predictor variable will be used in conjunction with other variables to determine the independent variable of expressed oral health literacy, as well as to give a description of the overall oral health status of the included population.

### **Research Questions and Descriptive Items**

Research Questions:

1. Is there an association between the participant's expressed level of oral health literacy and the frequency at which they practice oral hygiene techniques?

$H_a1$ : There is an association between the participant's expressed level of oral health literacy and the frequency that they practice oral hygiene techniques.

$H_01$ : There is no association between the participant's expressed level of oral health literacy and the frequency that they practice oral hygiene techniques.

2. Is there an association between the participant's expressed level of oral health literacy and the frequency at which their children practice oral hygiene techniques?

$H_a2$ : There is a relationship between the participant's expressed level of oral health literacy and the frequency that their children practice oral hygiene techniques.

techniques.

$H_02$ : There is no relationship between the participant's expressed level of oral health literacy and the frequency that their children practice oral hygiene techniques.

3. Are Kentucky Appalachian adults and children practicing oral hygiene techniques at the same frequencies?

$H_a3$ : There is a difference in how often oral hygiene techniques are used between adults and children.

$H_03$ : There is no difference in how often oral hygiene techniques are used between adults and children.

4. Were there differences in the survey responses gathered from the transitional Kentucky Appalachian county and the distressed Kentucky Appalachian county?

$H_a4$ : There are differences in the survey responses collected between the transitional and distressed counties.

$H_04$ : There are no differences in the survey responses collected between the transitional and distressed counties.

#### Descriptive Items:

1. Do Kentucky Appalachian adults practice oral hygiene techniques at frequencies as recommended by the American Dental Association?
2. Do Kentucky Appalachian children practice oral hygiene techniques at frequencies as recommended by the American Dental Association?
3. Do Appalachian adults perceive dental decay as a health risk?
4. Do Appalachian adults feel that dental decay is a preventable health risk?

5. Do Appalachian adults feel that they can personally decrease the risk of dental decay?
6. Do Appalachian adults perceive oral hygiene techniques as important for good health?
7. To what level do Appalachian adults perceive that enforcing childhood oral health techniques will decrease the risk of dental decay as their children age?
8. Do Appalachian adults perceive poor dental health as a normal event?

The hypotheses and research questions will be answered by data collected from a survey personally distributed in a sample Kentucky Appalachian population. Survey items will be primarily presented using a Likert scale response format. An example of this scale would be using 1 - 5, with 1 being 'completely disagree' and 5 being 'completely agree'. The corresponding number of each rate will then be used to statistically analyze the data set in order to determine answers for each hypothesis and research question.

### **Theoretical Framework**

The theoretical framework for this study is found in the health belief model (HBM). The HBM was initially developed in the early 1950s by social psychologists in order to explain why people fail to partake of programs that are designed to prevent and detect disease (Glanz, Rimer, & Viswanath, 2008). Over time, the HBM was adjusted and extended by others in order to examine the behaviors and attitudes people hold towards health risks (Glanz et al., 2008). This theory takes into consideration the perceived susceptibility and severity a person believes a health risk poses, as well as their perceived



benefits of a health habit and their perceived barriers to adopting the health habit. The HBM also includes the construct of self-efficacy, or the personal belief that a person can adopt an appropriate health habit in order to obtain the desired outcome, such as avoiding a health risk (Glanz et al., 2008). These constructs are used to predict why people decide to adopt or reject health habits that can assist in disease or health risk prevention. A deeper analysis of the HBM can be found in Chapter 2.

The HBM theorizes that people with a higher level of perceived personal disease risk along with a higher level of belief towards the seriousness of the disease, are more likely to adopt a health behavior or habit that decreases the risk of that particular disease (Glanz et al., 2008). These two constructs are included in this study by evaluating for how caregiver's view dental decay as a health risk in themselves and their dependent children. The HBM predicts that if caregiver's are found to believe that dental decay is serious health risk, they will be more likely to adopt positive oral health habits to decrease the risk of dental decay. However, if it is found that caregiver's do not see dental decay as a potential health risk, the HBM predicts that they will be less likely to adopt positive oral health habits. If this is found to be the case in this study, this may suggest that education is needed regarding poor oral health being a health risk to encourage the use of proper oral hygiene techniques. The construct of perceived benefits is also included in this study. This construct uses the belief regarding the positive aspects of a health behavior to predict the behavior's use. People who believe a health behavior will provide a decreased risk of disease are more likely to adopt the behavior (Glanz et al., 2008). By analyzing the beliefs held by Appalachian caregiver's towards oral hygiene

techniques as dental decay prevention, it may be predicted whether they would be likely to adopt more positive oral health behaviors.

### **Nature of the Study**

This study will utilize data collection by way of a personally delivered survey method design. Survey data collection has long been used as a way to gather data that is representative of a population (Bartlett, Kotrlik, & Higgins, 2001). Surveys are a versatile method of data collection as they can gather data that can be used to produce statistical calculations and comparisons, but can also gather data that provides a descriptive overview of an attitude, belief, health risk or issue (Fowler, 2014).

### **Definitions**

*Appalachia:* Refers to the 205,000 square mile region that encompasses the Appalachian Mountain range and includes portions of 13 states, from Southern New York to Northern Mississippi (Appalachian Regional Commission, 2016). This region is home to some 25 million people (Pollard & Jacobsen, 2011). The Kentucky Appalachian region includes 54 of its easternmost counties, in which approximately 1.2 million Kentuckians live (Pollard & Jacobsen, 2011). Thirty-seven Kentucky Appalachian counties are considered to be in a distressed state, with poverty rates that are up to three times the national average (Commonwealth of Kentucky, 2015). Kentucky has historically contained more distressed counties and communities than any other Appalachian state and continues to display this unfortunate trend (Commonwealth of Kentucky, 2015).

*Health literacy:* Describes a person's ability to obtain, understand, and utilize health related information and directions. Health literacy level can affect three different key points of healthcare: access and use of health information, the patient-medical professional relationship, and self-care (Paasche-Orlow & Wolf, 2007). A low level of health literacy has been linked to a lower level of overall health as well as with an increased rate of negative health outcomes (Nutbeam, 2008; Paasche-Orlow & Wolf, 2007).

*Oral health literacy:* Part of a person's overall health literacy status, oral health literacy refers to how a person absorbs and understands information pertaining to oral health. Having good oral health literacy is believed to be a critical and necessary aspect for people to have in order to improve their oral health (Horowitz & Kleinman, 2008).

*Oral hygiene techniques:* Includes brushing and flossing. When utilized correctly, these methods arguably provide the most important and effective form of defense against dental decay and disease (Kidd, 2011).

### **Assumptions**

As data collection will take place within the Appalachian region, an assumption of this study is that all included participants are residents of the Kentucky Appalachian area. No data will be collected as to how long each participant has resided in Appalachia, or if they have moved away from Appalachia and then returned during their lifetime. A second assumption of this study is that the adults involved serve as primary caregiver's, have legal custody of, and live in the same household as their children. No data will be collected that could serve as proof of these assumptions.

### **Scope and Delimitations**

With Kentucky's long history of poor oral health in its Appalachian communities continuing into present day, this health risk is still a severe public health threat that keeps encompassing generations. Some documentation suggests that targeting Kentucky children, such as with dental sealant programs, is the best way to break the cycle of poor dental health that is occurring (Reed, 2016). However, children who already have dental decay are presenting to school-based sealant programs, suggesting that this process is beginning in the home while the children are very young and dependent on their caregiver's for proper oral hygiene. Considering this, targeting young children themselves may not be the most successful path in breaking the cycle of poor oral health. In response to this realization, the study presented here is designed to evaluate the beliefs and attitudes towards oral health that are held by Appalachian adults. This will provide information into how Appalachian adults utilize oral hygiene techniques as it may be this group that would provide the most benefit in breaking the cycle of poor dental health if targeted with public health intervention efforts.

The boundaries of this study are firmly centered on the Kentucky Appalachian population. Kentucky has a high rate of fluoridated water supplies, dental sealant programs, and dental professional utilization (Saman et al., 2011). However, in Kentucky's rural Appalachian population there are areas where dental disease and edentulous rates exceed the national averages, placing this population at an increased risk for poor dental outcomes (Saman et al., 2011). The Kentucky Appalachian region is host to some of the nation's socioeconomically poorest communities who also suffer from

sporadic and uneven access to both dental insurance coverage and dental care services. These factors have assisted in creating a large health disparity in the oral health status between Kentucky Appalachians and their non-Appalachian counterparts.

The data from this study could potentially be used to address oral health disparities that exist in Appalachian areas beyond the Kentucky region. The Appalachian region across all 13 states have a common theme in that the people located here make less than the national per capita income, and also experience higher rates of unemployment particularly in the counties that are defined as being in a distressed state (Appalachian Regional Commission, 2016). The Appalachian region also suffers from lower than national levels of high school completion, indicating that a lack of education is present in most Appalachian communities, again especially in the communities that are considered distressed (Appalachian Regional Commission, 2016). These shared sociodemographic trends suggest that the Appalachian population is similar regardless of state lines, making it possible to make generalizations in one area that could apply to other Appalachian areas, particularly in counties that share the same categorization such as distressed.

### **Limitations**

A limitation of this study is that it requires the participants to have a basic level of literacy in order to read and fill out the study survey. The requirement of self-reading is necessary to avoid any bias towards answers that a second party may inflict with tone or stance, be it unintentional or otherwise. To address this limitation, the survey will use basic language to make it as easy as possible to understand what is being asked. The

directions will also be written in a clear manner and face-to-face explanation of the directions will also be available to each participant if needed.

Another limitation is that data is being collected from only two Kentucky Appalachian communities. Having data from all 54 counties that make up the Kentucky Appalachian region would supply much more in-depth data regarding the oral health habits and beliefs that are present. However, that is beyond the scope of this study. This limitation will be acknowledged and addressed by assuming the generalizability of results only to other Appalachian communities that hold similar sociodemographic traits to the two that are included in this study.

### **Significance**

The primary goal of public health officials is to prevent a disease or health event from occurring, as opposed to the medical field which is largely more focused on treatment after the health event has occurred. To do this, public health officials must understand the factors which may be influencing or leading to the health event occurring (American College Health Association, 2016; Centers for Disease Control, 2015) In understanding these factors it is useful to utilize the social-ecological model which takes into consideration the relationships between individual, community, and societal factors which may be influencing the rate of a health event in any population (Centers for Disease Control, 2015). This proposed study is focused on providing individual level data to help further understand the factors that may be influencing the rate of dental decay and disease that is occurring in the Kentucky Appalachian population. The collected data may be valuable in assisting to bring social change to the community as only by understanding

currently held attitudes and beliefs towards a health event can we hope to modify and transform those attitudes and beliefs into more positive health behaviors over time (Leicht, 2013). To achieve this, the proposed study will supply data that could be of use to public health officials when designing and implementing oral health programs and interventions in the Kentucky Appalachian region. If a relationship can be identified between the level of oral health literacy of adults and the usage rate of oral hygiene techniques being enforced in their dependent children, this may suggest that caregiver education is needed to increase the usage rate of oral hygiene techniques. A higher usage rate, especially in the very young, may decrease the number of children that are presenting to school-based sealant programs with dental decay already present. Raising awareness about the benefit of proper oral hygiene techniques and the utilization of such practices may help decrease the rate of poor oral health, particularly in communities where dental health professional access is low to nonexistent. By targeting the oral health literacy level of Appalachian adults, this may assist public health officials in breaking the cycle of poor oral health that is so prevalent in this population.

### **Summary**

The Kentucky Appalachian population has long suffered from an overall poor level of oral health. While current efforts at eliminating this health disparity have included increasing dental insurance access and targeting school-aged children with sealant programs, this study suggests that a more effective target for intervention would be found in improving the oral health literacy level of Appalachian adults. In support of this suggestion, data will be collected that will provide an overview of the current usage

rate of basic oral hygiene techniques and evaluate for a relationship between this usage rate and the expressed level of oral health literacy of Appalachian adults. The attitudes and beliefs held by the Appalachian participants towards oral health will also be documented to determine if education could be used to improve currently held ideals. This data could be valuable in creating public health interventions to assist in breaking the cycle of poor oral health that is present in the Appalachian community, thereby helping to introduce a positive social change to this population.



## Chapter 2: Literature Review

### **Introduction**

The poor oral health status of the Appalachian region is a much documented and established disparity (Polk et al., 2008). Even with advancements in water fluoridation efforts, school-based sealant programs, and an increase in dental insurance coverage, Kentucky repeatedly places among the nation's highest for untreated childhood dental decay and edentate adults (Dawkins et al., 2013; Kandel et al., 2012; Oral Health in Kentucky Technical Report, 2016). This information suggests that there are additional factors in existence that are contributing to the poor oral health status of the Kentucky Appalachian population. This study seeks to investigate for additional factors by evaluating for a relationship between the level of oral health literacy of Kentucky Appalachian adult's and their use of oral hygiene methods both in themselves and their dependent children. Additionally, the perceived level of benefit that these caretakers feel that these methods provide will be recorded.

In this chapter, information is presented that shows how this study is largely driven by the key concepts of the Health Belief Model. It also presents detailed data gathered from past and current research that supports the main focus and ideals of this study, as well as describes gaps that have been identified in the currently available literature. In cases where little established information is available, argument is made for the inclusion of, evaluating for, and providing information on such under-studied concepts.

## Literature Search Strategy

In the development of this proposal, several different online databases and search engines were used to gather supporting information:

Table 1

*Databases and search engines used in this study.*

---

Appalachian Regional Commission  
 Behavioral Risk Factor Surveillance System 2012  
 Centers for Disease Control and Prevention  
 Google  
 Google Scholar  
 Phys.Org  
 PubMed: U.S. National Library of Medicine, National Institutes of Health  
 United States Census Bureau 2010  
 University of Kentucky Online Library  
 Walden University Online Library

In most cases, a search engine was used in conjunction with a database. For instance, an abstract may have been found on PubMed but due to limited student usage rights, the actual research paper was then pulled from either the University of Kentucky or Walden University online library database so that the paper could then be perused in its entirety.

Many search terms were used to find appropriate and available supporting documentation within the included databases and search engines. When applicable, the same search terms were applied to each of the included data bases and search engines to ensure an in-depth search of available sources. The following is a non-inclusive overview of the major key search terms and phrases used in data discovery:

- Appalachian health literacy
- Appalachian dental health status
- Appalachian oral health status

- Appalachian region demographics
- Construct of perceived barriers
- Construct of seriousness
- Construct of susceptibility
- Constructs of the health belief model (HBM)
- Dental hygiene
- HBM
- HBM development
- Kentucky Appalachian health literacy
- Kentucky Appalachian region demographics
- Kentucky dental health status
- Kentucky economic status by county
- Kentucky health literacy
- Kentucky population by county
- Kentucky oral health literacy
- Kentucky oral health status
- Oral hygiene
- Oral hygiene habits in Appalachia
- Origin of the health belief model
- Perceived dental health
- Perceived oral health
- Self-efficacy

- Self-efficacy in Appalachia

All searches pertaining to oral health or ideals were performed twice: once with using the term 'oral' and once using the term 'dental'. This was to minimize the risk that sources may be missed due to the use of differing professional terminology.

Where appropriate and available, literature was included that was published in the standard most recent 10-year timeframe. However, there were instances where older information had to be included. For example, when describing the Health Belief Model, current sources of information were unclear as to the exact origins and development of this theory. Older, original work had to be located in order to give a clear understanding of the background to this theory and how it drives this study. In some cases, such as establishing the current picture of the health literacy status of Kentucky Appalachians, data that is right on the 10-year inclusion cut-off mark were included as no updated information could be found. To my knowledge, these are the most recent sources documenting this concept in the area of interest. Additional, more recent resources were included to support the overall status, but these resources do not use Kentucky Appalachia as their focus but instead other areas of Appalachia. In one case, no specific documentation could be found to use to support or describe the included concept. For this instance, argument was made on the importance of this concept and linked it as a possible factor behind the results of another study, although this study did not specifically mention the concept.

Much effort was made to include supporting literature that was only from peer-reviewed sources. In instances where such literature was not appropriate, such as

determining population size or the economic status of Kentucky Appalachian areas, sources were used from federally and state funded or controlled sites. Examples of these sources are the data included that originates from the Appalachian Regional Commission, the United States Census Bureau, or the Fluoride Action Network.

### **Theoretical Foundation**

The established theoretical framework that is being used to support this study is the Health Belief Model (HBM). In the 1950s, the United States Public Health Service (PHS) existed to prevent disease and health risk as opposed to providing any treatment for established diseases (Rosenstock, 1974). Thus, the Public Health Service did not yet take into consideration any issues that were caused by a person's compliance with medical directions, health literacy level, or a lack of communication between medical professionals and patients: the PHS only focused on preventative efforts (Rosenstock, 1974). During this time, it was clear that public health prevention programs were being met with limited participation and success (Strecher & Rosenstock, 1997). This trend was particularly evident in the low participation rates of the then available tuberculosis (TB) and dental disease screening tests, with continuation in the later introduced rheumatic fever, polio, and influenza screening and prevention efforts (Rosenstock, 1974). In 1958, Hochbaum presented probability samples taken of adults living in cities that had conducted free TB screening programs in mobile X-ray centers (as cited by Strecher & Rosenstock, 1997). In this report, Hochbaum included the belief that participants had towards how susceptible they were to contracting TB as well as their belief towards perceived personal benefit of early TB detection and diagnosis (as cited by Strecher &

Rosenstock, 1997). Hochbaum found that participants who displayed beliefs both in perceived personal susceptibility and benefit of early detection were four times more likely to have had a voluntary chest X-ray screening as those who displayed no beliefs in either category (as cited by Strecher & Rosenstock, 1997). Strecher & Rosenstock (1997) contend that this work by Hochbaum laid the ground work for the HBM in contributing the first two included constructs of perceived susceptibility and perceived benefits, and showing how these constructs can be used to determine how likely people are to partake of public health efforts. The work by Hochbaum was of considerable contribution in that it took into consideration the personal beliefs people hold towards a health risk, a concept that until then had been overlooked by the PHS.

Over the next several decades, further investigations by many different researchers helped to expand and clarify the two constructs identified by Hochbaum into the HBM that is used today (as cited by Strecher & Rosenstock, 1997). The HBM is now recognized to utilize four main constructs which include the perceptions of susceptibility, severity, benefits, and barriers (Glanz et al., 2008; Hayden, 2014). Any of these constructs can be used alone or in combination to explain a person's health behavior or habits (Hayden, 2014). The HBM also includes the concepts of cues to action and self-efficacy that serve as additional factors to the four main constructs (Hayden, 2014). The HBM constructs can also be influenced by modifying variables such as cultural habits and beliefs, education level, past experiences, age, motivation and other such personal demographics (Hayden, 2014).

The four main constructs that make up the HBM all deal with different perceived beliefs that a person may hold towards a disease or health risk. The first construct of the HBM is perceived susceptibility which is described as the greater transitional a person feels from a disease or health event, the more likely they are to adopt health behaviors or habits that may decrease that risk (Hayden, 2014; Rosenstock, Strecher, & Becker, 1988; Strecher & Rosenstock, 1997). Although this seems a very strong indicator construct in terms of assessing how likely people are to adopt a health habit or behavior, Carpenter (2010) discovered differently. Through a meta-analysis of published studies utilizing the HBM, Carpenter (2010) found that susceptibility alone to be the weakest predictor for a person's behavior. This finding contradicted the earlier established belief that susceptibility was a strong indicator and predictor for health prevention behavior and treatment (as cited by Carpenter, 2010; Janz & Becker, 1984).

The construct of severity serves to describe the level of seriousness a health risk is perceived as posing (Strecher & Rosenstock, 1997). This construct theorizes that the more serious risk a person perceives a disease or health event as posing, the more likely they are to adopt preventative health behaviors. While this construct can be influenced by medical knowledge, it is possible that the perceived seriousness towards a health risk is also based on a person's accepted cultural norms or personal experience (Hayden, 2014). Carpenter (2010) found that in general severity alone was a poor indicator of whether a person would adopt a health behavior or habit, which was similar to previous findings by Harrison, Mullen, and Green (1992). However, when only studies that included taking prescription drugs were included in the analysis, it was found that there was a strong

relationship between severity and whether the drug regime was adopted (Carpenter, 2010). This suggests that this construct can be successfully used under certain circumstances, such as with predicting the adoption of drug therapy.

The construct of benefits describes a person's opinion of how well a new health behavior or habit will work in decreasing a health risk (Hayden, 2014; Joseph, Burke, Tuason, Barker, & Pasick, 2009). Carpenter (2010) found that the construct of benefits was a more effective predictor for prevention behavior than for treatment behavior. This suggests that prevention behaviors are more likely to be implemented before the occurrence of a health event than treatment behaviors that are recommended after a health event occurrence. The construct of benefits can also include the influence of perceptions that are not specifically health related. For instance, the financial gain or cost that a health behavior may entail could also be influential on how likely a person is to adopt the behavior (Glanz et al., 2008).

The last construct of the HBM is that of perceived barriers. This construct includes the perceived potentially negative aspects a person may use as reasons not to adopt a particular health behavior (Glanz et al., 2008). Barriers may include monetary expense, side effects, inconvenience, or time. Carpenter (2010) found that perceived barriers alone was the most influential of the four constructs when predicting the likelihood of health behavior adoption.

The concept of cue to action was included in the development of the HBM as an additional variable that could influence the other constructs and therefore also influence the likelihood of health behavior adoption (as reported by Carpenter, 2010; Glanz et al.,



2008). A cue to action can be from an external environmental influence such as viewing a media campaign or reading a pamphlet, or an internal influence such as a sneeze prompting the use of sinus medication (Carpenter, 2010; Glanz et al., 2008). The concept of self-efficacy was not included in the early formulations of the HBM but has since become an accepted variable to consider when predicting the adoption of health behaviors (Glanz et al., 2008). Self-efficacy is the confidence a person has to how successful they will be in conducting a health behavior well enough to obtain the desired outcome (Glanz et al., 2008; Schunk & Pajares, 2009). Since its inclusion, self-efficacy has been recognized as factor that differs among developmental levels and cultures and that can influence a person's education and career decisions as well as their health related decisions (Schunk & Pajares, 2009).

Used alone, Carpenter (2010) found the constructs of seriousness and susceptibility to be the poorer behavior adoption predictors of the HBM, which contradicted earlier conducted findings. However, he contends that these findings could be in error due to the following factors:

1. Susceptibility was difficult to measure in level as those who have experienced a health event do not vary in their perception of susceptibility: they are susceptible. Including those who were already diagnosed with a disease or health event likely skewed his results.
2. Self-efficacy is argued to influence and moderate the constructs of seriousness and susceptibility. Carpenter (2010) did not allow for this influence in his meta-analysis.

3. Carpenter (2010) stipulates that seriousness and susceptibility may be moderated by each other which is not considered in his study.

Therefore, the constructs of seriousness and susceptibility along with benefits are included in the presented study and will be used together as each holds applications which are the focus of this study. The construct of perceived susceptibility can be used to define populations who may be more at risk of a health event (Glanz et al., 2008).

Primarily, this study will evaluate for how Appalachian adults view dental decay as a health risk in themselves and in their dependent children, thereby identifying a possible population who may be more at risk of dental decay due to a low perceived susceptibility.

Descriptive items 3, 4, and 5 are specifically related to measuring the level of susceptibility this population may feel they are at from dental decay:

- Do Appalachian adults perceive dental decay as a health risk?
- Do Appalachian adults feel that dental decay is a preventable health risk?
- Do Appalachian adults feel that they can personally decrease the risk of dental decay?

By answering these questions, an overview of the population's perceived risk of dental decay may be established.

The construct of seriousness is included in this study as it is a vital concept on its own, but may also contribute to the population's perceived susceptibility to dental decay. Descriptive items 6 and 8 investigate how important the population views dental health as a part of their overall health level:

- Do Appalachian adults perceive oral hygiene techniques as important for good health?
- Do Appalachian adults perceive poor dental health as a normal event?

Gathering this data will provide an overview into how serious the included population views the risk of poor dental health. The perceived seriousness may also tie into the perceived susceptibility to dental decay that this population may demonstrate. For instance, if it is found that the included population indicates that poor dental health is a normal event, this may contribute to a higher level of perceived susceptibility: the event is normal, it will likely occur, and so the population feels more at risk. In this way, these two constructs will work together and overlap in the research questions to give a more detailed and effective overview of the included population.

The construct of perceived benefits will also guide this study. An application of this construct is defining the actions that may bring about the desired health outcome (Glanz et al., 2008). In this study, the desired outcome is improved dental health. Research questions 1, 2, and 7 relate to measuring the level of benefit that Appalachian caregiver's feel oral hygiene habits will contribute to their overall dental health level:

- Do Kentucky Appalachian adults practice oral hygiene techniques at frequencies as recommended by the American Dental Association?
- Do Kentucky Appalachian children practice oral hygiene techniques at frequencies as recommended by the American Dental Association?
- To what level do Appalachian adults perceive that enforcing childhood oral health techniques will decrease the risk of dental decay as their children age?

A lower rate of use of oral hygiene habits may indicate a lower perceived benefit level in the included population.

By using these constructs together, the fundamental foundation of the HBM may be applied to this study to predict the needs of this population. Using the HBM, it may be predicted that if caregiver's are found to believe that dental decay is a serious health risk, they may be more likely to adopt positive oral health habits in order to decrease their risk of dental decay. These results may indicate a need of community education regarding the adoption of proper oral hygiene habits. Conversely, if it is found that caregiver's do not see dental decay as a potential health risk for themselves or their dependent children, the HBM would predict that this population is less likely to adopt positive oral hygiene habits. These results would show a need for education regarding the risk of poor oral health in order to encourage the adoption of proper oral hygiene techniques in this population. Using the HBM can help predict the needs of a population, in this example by predicting the focus of community education programs.

### **Literature Review Related to Key Variables and/or Concepts**

#### **Kentucky Appalachian Region**

The Appalachian region is an area containing 205,000 square miles that follows the Appalachian Mountains reaching across 13 states from Mississippi to New York (Appalachian Regional Commission, 2016). Based on its national ranking position, each of the 420 counties that are included in the Appalachian region is classified into one of five economic status ranks (Appalachian Regional Commission, 2016). These rankings are as follows:

*Distressed:* The worst 10 percent of the nation's counties, these counties are the most economically distressed areas.

*At-risk:* Ranked between the worst 10 to 25 percent of the nation's counties and are at risk of becoming distressed.

*Transitional:* These counties are seen as transitioning between strong and weak economies and are made up of the worst 25 to the best 25 percent of the nation's counties.

*Competitive:* Competitive counties are those that are ranked in the best 25 percent to 10 percent of the nation's counties.

*Attainment:* The strongest of economies, these counties are those that rank in the best 10 percent of the nation's counties.

With 38 of its 54 Appalachian counties being ranked as distressed, Kentucky has the largest number of distressed counties out of all the 13 states included in the Appalachian region (Appalachian Regional Commission, 2015; Appalachian Regional Commission, 2016). The highest ranking found in Kentucky Appalachia is shared by four counties that have attained transitional status. However, all four of these counties hold areas that are considered distressed, indicating that pockets of economically depressed people are still present in these counties.

Much like other areas of Appalachia, the Kentucky Appalachian region suffers from rates of dental disease and decay that exceed the national average, both in children and adults (Dawkins et al., 2013; Kendal et al., 2012; Oral Health in Kentucky Technical Report, 2016). To assist in combating poor dental health, Kentucky passed regulation in

1994 establishing mandatory water fluoridation for all water systems that are serving a population of 3,000 or more (Fluoride Action Network, 2016). Legislature mandates that communities between 1,500 and 3,000 are required to add fluoride to their water supplies but only if the appropriate equipment is available from the Cabinet for Human Resources (Fluoride Legislative User Information Database, 2012). From the 2010 United States Census, it is estimated that there are 310 Kentucky towns containing 3,000 and under inhabitants and while it is unclear if any of these are adhering to fluoridation guidelines, it is reported that over 99% of Kentuckians have had access to fluoridated water systems since 2006 (Fluoride Action Network, 2016).

School-based sealant programs are another effort made in the state of Kentucky in order to decrease the rates of childhood dental decay. These can include actual plastic sealants that are coated on the back teeth of children that act as a barrier to bacteria and food particles, or fluoride varnishes, which are painted on the teeth to assist in hardening the existing enamel (Madison County Health Department, 2016; Northern Kentucky Health Department, 2016). School-based sealant programs were added to Kentucky Medicaid as a preventative program in the 1990's and target children when their first and second permanent molars appear, ages 6-7 and 11-13 (Reed, 2016). To date, there are 23 local health departments who are participating in and practicing sealant programs in Kentucky schools where 50% or more students are eligible for free or reduced cost lunches, which are indicative of areas of the most need of health services (as reported by Reed, 2016). In addition, the University of Kentucky Dentistry department assists in over 40 Kentucky counties by providing mobile units to various schools in order to provide

sealants to children of appropriate age (University of Kentucky Dentistry, 2012). It has long been believed that sealants were the most effective way of preventing childhood dental decay and disease (Dawkins et al., 2013; Reed 2016). However, new evidence is emerging to refute this accepted fact. In the COHRA1 cohort study conducted by the University of Pittsburgh using participants from Appalachian West Virginia, high rates of dental decay were found in children even with the increased use of dental sealants (University of Pittsburgh, 2016). The University of Pittsburgh also found that in some areas, dental decay occurrence was happening in young children at 144% the rate reported by the Center for Disease Control's 1999-2004 National Health and Nutrition Examination Survey (University of Pittsburg, 2016). The data provided by the University of Pittsburg shows that dental sealants may not be decreasing the rate of childhood dental decay, and that the rate of dental decay may be occurring in larger rates than previously documented in some Appalachian areas, regardless of sealant use rates.

In a report conducted by Delta Dental of Kentucky and Kentucky Youth Advocates, it was found that the oral health status of Kentucky school children is worsening, even though access to oral health care has greatly improved over the last 15 years (as reported by Patrick & Thomas, 2016). This report found that the number of 3<sup>rd</sup> and 6<sup>th</sup> graders in need of early or urgent dental care rose from 32% in 2001 to 49% in 2016. They also acknowledge that children who reside in Appalachian areas demonstrated the greatest need for urgent dental care. The report also established that although sealant use in 3<sup>rd</sup> and 6<sup>th</sup> graders has increased by 14% since 2001, 50% of the children included in the report were found to have had no sealants on any of their

permanent molars. This report and the findings by the University of Pittsburg suggest that despite efforts to combat childhood dental decay have been in place, the rates of childhood dental decay are increasing especially in populations of lower socioeconomic status, such as Appalachian communities. These findings support the need for more research in local communities to determine if any other opportunities exist for public health officials to use in order to help in decreasing the rates of dental decay.

### **Independent Variable: Oral Health Literacy**

The term oral health literacy was first defined and documented in the Healthy People 2010 goals (as reported by Horowitz & Kleinman, 2008). It mirrors the concept of health literacy in that it describes the level to which people can obtain, process, and understand the basic information that is needed to make appropriate dental health decisions (Horowitz & Kleinman, 2008; Jones, Lee, & Rozier, 2007). The Healthy People 2010 report suggests that poor oral health literacy may be acting as a barrier to proper dental health and is assisting in creating dental health disparities and poor oral health outcomes (Centers for Disease Control and Prevention, 2011; Jones et al., 2007). Milfrom, Garcia, Ismail, Katz, and Weintraub (2004) suggest that poor oral health literacy is a national public health issue which worsens in areas of lower socioeconomic and demographic status. People with low oral health literacy levels are less likely to utilize preventative habits or dental care professionals, thereby contributing to higher rates of dental disease and decay (Horowitz & Kleinman, 2008).

To date, it is unclear how oral health literacy is affecting the Kentucky Appalachian population; however it is documented that these areas do suffer from low



health literacy levels (Ludke et al, 2006; Moser et al, 2015). Polk et al. (2008) document that poor oral health is a shared trait over much of the Appalachian region. In their cross-sectional study using Appalachian parent-child pairs in West Virginia and Pennsylvania, they plan to investigate how individual, family, and community factors were contributing to dental disease (Polk et al., 2008). Polk et al. (2008) wish to examine for a relationship between oral hygiene habits such as brushing and flossing and rate of dental caries. This study is still ongoing and so no final data are available, however Polk et al. (2008) document the need for studies that investigate for factors that are contributing to the poor oral health status of Appalachian communities as economic disadvantages alone have been shown to have little overall impact on the rate of dental service use in this population.

Guo et al. (2014) further document that people who do hold dental health insurance are not utilizing preventative dental care services, particularly in more rural areas and so economic status is not necessarily a sole barrier to proper dental health. In this telephone survey based study that took place in rural Florida areas, Guo et al. (2014) found that the influence of oral health literacy was just as an important factor on self-reported oral health status as the standardized effects of gender, race, education, financial status and the quality of patient to dentist communication. These findings show that oral health literacy can be a factor in oral health status and may be influencing other perceived barriers to proper oral health. A limitation with this study is that it was conducted in a non-Appalachian population; however it supports the possibility that oral health literacy may be affecting Appalachia in a similar fashion.

Miller, Lee, DeWalt, and Vann (2010) conducted a cross-sectional study of young children and their caregiver's who presented for care at the University of North Carolina at Chapel Hill School of Dentistry. Here they collected data on the caregiver's oral health knowledge level, oral health behaviors, and the reported and clinical oral health status of each child (Miller et al., 2010). The data showed that caregiver literacy was significantly associated with their dependent child's dental disease status. Caregiver's who demonstrated a lower level of oral health knowledge and behaviors were more likely to have children who presented with dental disease (Miller et al., 2010). Although the study does not specify designation, North Carolina does hold Appalachian counties so it is possible that some participants shared the same overall demographics as Kentucky Appalachian's. The findings by Miller et al. (2010) suggest that a low level of oral health knowledge, i.e. oral health literacy, may also be contributing to the very high rates of childhood dental decay that is occurring in Kentucky Appalachian areas and that an investigational study into this population may show similar results. Lee, Divaris, Baker, Rozier, and Vann (2012) also conducted a study that associated oral health literacy with oral health status in a North Carolina population. Their results mirrored that of Miller et al. (2010) in that a lower oral health literacy level was associated with a poorer level of oral health. Lee et al. (2012) contend that while much work exists to associate health literacy with overall health status, efforts towards linking literacy to dental health is a relatively new phenomenon. This suggests that more research is needed to investigate oral health literacy in differing populations as there are gaps in the current knowledge.

**Dependent Variable: Oral Hygiene Methods**

Oral hygiene methods include techniques such as brushing and flossing. When used correctly, these methods arguably provide the most important and effective form of defense against dental decay and disease (Kidd, 2011). The American Dental Association (2016) maintain that brushing twice a day and flossing once per day are the most effective oral hygiene methods people can utilize in preventing dental decay, both in adults and children. Frisbee, Chambers, Frisbee, Goodwill, and Crout (2010) conducted a cross-sectional convenience study that investigated for associations between oral hygiene habits, obesity, and systemic inflammation in children from Appalachian West Virginia communities. They collected the data from health screenings conducted at community based facilities. Frisbee et al. (2010) conclude that preventive oral care in children is important as oral health status is associated with other diseases. The work conducted by Frisbee et al. supports the fact that proper oral hygiene methods are important to overall health and that these methods should be investigated to establish if they are being used correctly.

At the time of this study, Neiswanger et al. (2015) were conducting a longitudinal study utilizing the Center for Oral Health Research in Appalachia (COHRA), which is a collaboration effort between the University of Pittsburg and West Virginia University to investigate the high rates of dental disease in these areas. Neiswanger et al. (2015) are evaluating for factors influencing the oral health of pregnant women and their babies located in Appalachian areas of West Virginia and Pennsylvania and to date have reached 70% of their recruitment goal. The women recruited from West Virginia represent rural

communities versus the women from Pennsylvania which are considered urban. Thus far the data collected by Neiswanger et al. (2015) are showing that women in West Virginia are brushing their teeth at similar rates as women in Pennsylvania, but do not floss or see a dentist at the same rate, have increased rates of dental disease, and have less education and more unemployment. A major focus of this study is to investigate and follow the dental health status of the children born during the study period to determine if the children's dental health status differs between the two groups of women, possibly indicating that poor dental health may be occurring in children of very young age and that this is setting a pattern that they will continue to follow throughout their life cycle.

The studies conducted by Kidd (2011) and Frisbee et al. (2010), as well as the emerging data from Neiswanger et al. (2015) all support the importance of evaluating for the use of oral hygiene methods across populations. If a deficit in use is found, this may point towards an opportunity for community education promoting the use of proper oral hygiene as a means in decreasing the rate of poor oral health that is occurring.

### **Dependent Variable: Perceived Control of Oral Health**

The perceived control of oral health is the extent to which people feel that they are in control of their oral health status. There is a distinct lack of current documentation specifically on this concept. This study will evaluate for how people in an Appalachian Kentucky community feel towards controlling their own oral health. While it is important to obtain professional dental services for optimal oral health, it is equally as important to perform oral hygiene methods in the home, such as brushing and flossing to properly prevent dental disease. The study presented here will evaluate for how well people feel

they are in control of their oral health versus feeling that only by seeing a dental health professional will they have proper oral health, meaning they believe only a dentist has the ultimate control over their oral health status. It may be found that poor self-efficacy may exist in this community: in this context, a lack of confidence in how successful people feel they can conduct oral hygiene methods well enough to obtain proper oral health. It has been documented that self-efficacy is a functional predictor to adopting and maintaining a health behavior: the more confidence people have in conducting a health behavior in such a way as to obtain the desired affects, the more likely they are to adopt the health behavior (Schwarzer et al., 2007). Schwarzer et al. (2007) found that self-efficacy was a better predictor of health habit adoption than health risk perception, or the HBM construct of susceptibility. If it is found that low self-efficacy towards oral hygiene does exist, this could provide valuable information when designing educational programs and messages regarding Appalachian oral health. This may also tie into the findings of Savage et al. (2014) in that some of their participants felt it was easier to simply ‘give in’ to poor oral health, possibly suggesting that those participants do not perceive that they have control over their own oral health status.

**Dependent Variable: Perceived Importance of Oral Hygiene**

The perceived importance of oral hygiene is how important people think oral hygiene habits are in promoting both good oral health, but also for their overall health status. The perceived importance of oral hygiene is vital for understanding how people think about and view oral hygiene habits and how much importance they place on such

habits. The more importance they place on these habits, the more likely they may be to utilizing such habits in their daily routines.

A study was recently conducted with students attending a state university located in an Appalachian Kentucky community (Savage, Scott, Aalboe, Stein, & Mullins, 2014). The study consisted of 67 students participating in face-to-face focus groups and 587 students taking a survey. The results of this study lend support to the trend of poor dental health that is found in Kentucky: 50.3% reported brushing twice per day, 17.6% reported flossing once per day, and 23.9% reported that they had visible, active decay in their teeth (Savage et al., 2014). In the focus groups, it was found that several of the participants felt that poor dental health in Kentucky was not an accurate depiction of the true oral health status and that this misconception was due to media portrayals (Savage et al., 2014). However, some of these same participants went on to describe how many people they knew from their home towns routinely never saw a dentist and they admitted that they thought ‘some people’ didn’t understand the necessity of proper oral care (Savage et al., 2014). Most participants stated the reason that they did not floss was that it is a time consuming process, although some recognized that flossing is one of the best decay prevention methods. Many participants described how it was easier to give in to the poor oral health status of their communities and simply not care or place importance on proper oral health (Savage et al., 2014). Wondering if good oral health was worth the effort it requires was another point brought up by some participants (Savage et al., 2014). The work by Savage et al. (2014) is an excellent source for how oral hygiene is perceived in a rural area and results such as these can provide invaluable information when developing

programs targeting such populations. The limitation to this study was that it was conducted at a state university and so both in state and out of state students participated: there is no way to ensure that only students from Kentucky Appalachian communities were included. While health disparities in Appalachia have been well documented, Savage et al. (2014) maintain that research such as theirs that investigate the attitudes towards such health disparities is what will provide invaluable information for message design in future Appalachian health interventions.

### **Predictor Variable: Dental Decay**

In this study, information will be obtained regarding if the included participants have ever had dental decay in the form of dental cavities. The purpose of this data is two-fold. First, it will serve to demonstrate if the included participants are typical of the overall Appalachian region. It is documented that the Kentucky Appalachian population has increased rates of dental cavities in both adults and children, and increased rates of childhood decay (Dawkins et al, 2013; Oral Health in Kentucky Technical Report, 2016). While it is beyond the scope of this study to physically examine participants for their oral health status, self-reported data will be gathered to obtain a current overview of the included participant's oral health status. Secondly, this data will be used as a partial indicator of the current oral health literacy level of the included participants and used as a variable against other information, such as oral hygiene use frequencies.

### **Summary and Conclusion**

After an extensive search of the available literature, many trends have been identified and documented.

1. Although the overall Appalachian dental health status has much documentation showing that it is a health disparity, little research can be found that exists to explain this phenomenon.
  2. Currently accepted reasons behind this disparity include lack of insurance coverage and a lack of available dental health professionals, however new research is emerging that shows that these reasons are not enough to explain why dental health statuses continue to be poor, and in some cases worsen, in Appalachian areas.
  3. In the state of Kentucky, sealant programs are widely used in an effort to decrease the rate of childhood dental decay. However, new research centering on a West Virginia community suggests that sealants are not decreasing this health risk.
  4. Although the concept of health literacy is widely documented as being directly linked to a person's health status, little research has been conducted that investigates the concept of oral health literacy, especially in Appalachian areas.
  5. Little is known about the oral hygiene habits utilized in Appalachia. Two large cohort studies that included investigation for these habits were located, but they are still in progress and so little data is available. These two studies do not focus Kentucky Appalachia specifically, but areas of West Virginia and Pennsylvania.
- Despite school-based sealant programs and widespread fluoridation efforts, Kentucky continuously ranks among the nation's highest for childhood dental decay and edentate adults. A common factor among these efforts is that they supply little in the way of education regarding proper oral hygiene habits or improving oral health literacy. These



factors combined with the gaps in current literature regarding how Kentucky Appalachians view oral hygiene and oral health all point to a need for further research in this population. If it can be established that there is poor self-efficacy regarding oral health in Kentucky Appalachian communities, this may give public health officials valuable knowledge in how to develop new messages and community education efforts that target the dental health disparity occurring in Appalachia.

## Chapter 3: Research Method

### **Introduction**

The purpose of this research study was to assess for perceived attitudes towards oral health as well as the usage rates of oral hygiene habits in two Kentucky Appalachian communities. These data were sought as it is suspected that a lower level of oral health literacy may be contributing to the elevated rates of poor oral health that exists in this overall population.

In this chapter, the target population and the research design are thoroughly presented. The methodology and the statistical analysis methods that will be conducted on the gathered data are also presented and solidified. The projected sample size is determined by taking into multiple factors, and the threats to the validity of the study are examined and discussed.

### **Research Design and Rationale**

The study presented here will follow a quantitative research design in that it will be primarily developed to collect numerical data, which is the distinctive hallmark of the quantitative research method (Creswell, 2014). The quantitative research method can be further broken down into four main research types: experimental, quasi-experimental, correlational, and descriptive (Center for Innovation in Research and Teaching, 2017; University of Wisconsin, 2017). The experimental and quasi-experimental designs are considered classic quantitative methods as they involve manipulating the independent variable to measure any effects on the dependent variables (Baltimore County Public Schools, 2017; Creswell, 2014). The remaining types of correlational and descriptive

utilize quantitative analysis methods but do not involve any variable manipulation, and so are considered observational in nature. The study presented here contains both correlational and descriptive design methods. It is correlational as relationships between different variables will be examined for and interpreted using statistical analysis methods (Privitera, 2011). With the collected data, this study will also provide a descriptive account of how the included participants feel towards and utilize the variables of interest.

In this study, each of the survey items is closed-ended, or focused, in design: they require each participant to select an answer out of those that are provided and there are no areas for open-ended, write in responses. The items follow a Likert ordinal scale design. A Likert scale is used to measure levels of agreement and disagreement in a linear intensity format (Trochim, 2006a). By ranking the levels of agreement or disagreement participants may have about a particular concept or statement, it may be possible to effectively measure the attitudes and beliefs held by a participant pool. All item answers are assigned a corresponding numerical scale. For example, the Likert scale item answers have ranking answers that run from 1 being 'strongly agree' to 5 representing 'strongly disagree'. None of these numerical values mean anything outside of this context: they are not rankings indicating that one answer is better than another; they are simply numerical ordinal designations that will allow the data to be evaluated using quantitative analysis methods.

This quantitative research design that involves closed-ended survey items is widely used to gather health related data. This method is valuable when investigating for casual relationships or for trends that may assist in explaining or predicting a health risk

or phenomena (Howlett, Rogo, & Shelton, 2014). The collected data is numerical in value and so can be measured and analyzed. This type of focused data is also objective as there is no misinterpretation that may occur when examining non-focused, open-ended, write-in answers. This design is of particular value to this study as it requires minimal engagement between the researcher and the included participants, thereby allowing data collection to occur during a quicker timeframe. Also, it allows for a clearer and easier to understand format that requires only basic comprehension skills in order to complete the survey. Using a survey with an open-ended question format may have required a higher set of literacy skills from participants and would have led to longer data collection times as it may have needed an increased amount of personal interaction between researcher and participants.

The surveys are paper-based and will be administered by me in person to all included participants. This method is appropriate to my constraints of time and available resources, as well as ensures a lower risk of poor response rate, meaning my time will be more productive than if I had selected a different administration method, such as an electronic survey.

The survey method of data collection is an integral part of behavioral, social, and epidemiological research (Saris & Gallhofer, 2007). Questionnaires and surveys can be specifically tailored to investigate for trends, attitudes and beliefs, or habits in a population of interest. This is especially valuable when researchers are evaluating for trends that may have little currently existing documentation. It is for these benefits that I chose to utilize a survey based research design for my dissertation.

## **Methodology**

### **Population**

The Kentucky Appalachian population consists of roughly 1.2 million people who live across 18,229 square miles (Pollard & Jacobsen, 2011). At 25.4%, the Kentucky Appalachian area suffers from the highest average poverty rates found in the entire Appalachian region (FAHE, 2015). Localized pockets across Kentucky Appalachia can suffer from poverty rates that exceed 40% (Appalachian Regional Commission, 2014). The poverty rates found in Kentucky Appalachia are greatly increased from the national average of 15.6%, indicating that a low socioeconomic status is strongly present in this area (FAHE, 2015). This high poverty rate is partially due to the Kentucky Appalachian per capita income. In 2014, this per capita income was \$30,308, which was significantly lower than the national per capita income of \$46,049 (FAHE, 2015).

Kentucky as a whole suffers from low literacy rates. In 1999, the National Center for Higher Education Management Systems (NCHEMS) found that 40% of Kentucky's working age population had reading skills that fell into the two lowest literacy levels, those of unable to read and reading at a very limited level (Legislative Research Commission, 2000). The focus of the report conducted by the NCHEMS was to create and implement a 20-year strategy to improve the educational and literacy levels found in Kentucky and so it is unclear if these statistics have changed as the strategy is still in implementation. As having low literacy is associated with having a low level of health literacy, it may be assumed that low literacy is contributing to the lower level of health

literacy found in the Kentucky Appalachian population as documented by Ludke et al. (2006).

Low socioeconomic status along with low literacy skills and low health literacy levels are hallmark indications of both vulnerable and underserved populations. While vulnerable and underserved are oftentimes used synonymously with each other when describing populations, the terms actually refer to separate points (Chang et al., 2004). Vulnerable populations are those that differ from others based on social and demographic characteristics, such as age, race, or socioeconomic status and who may not properly utilize available health services (Chang et al., 2004). An underserved population is one that actually has less than the recommended access to health services due to economic barriers, or cultural and linguistic differences. Based on the documented risks found in the Kentucky Appalachian population, it may be possible that portions of this population may be both vulnerable and underserved in nature, indicating a greater need of investigation in order to lower the risk of health disparities occurring in this population.

Samples from the Kentucky Appalachian population will be found by polling at local health departments (LHDs) and churches that are located in the Kentucky Appalachian region. These local venues are staffed by and serve people who live in the immediately surrounding communities. They offer population control in this study as it is unlikely anyone outside of the community of interest would be attending or accessing these venues.

The included polling venues are in two Kentucky counties, one of which has the official designation as ‘at risk’ while the other is ranked as ‘distressed’. There is almost a

\$10,000 a year difference in per capita income between these two counties, indicating that while both counties represent the region of interest, there is also a clear difference between the two in economic standing dependent on their county ranking as set by the Appalachian Regional Commission.

### **Sampling Procedures**

This study will follow a convenience sampling strategy. Convenience sampling is a type of non-probability method which consists of sampling methods that are based on the judgement of the researcher, as opposed to probability techniques which are based on random selection of the included units (Lund Research, 2014). Convenience sampling involves the inclusion of units that are representative of the population of interest and that are the easiest to access. This method of sampling oftentimes uses less resources and time than probability techniques and can allow a researcher to study populations that would otherwise be difficult to reach (Lund Research, 2014). For this convenience sample, participants will be selected based on their inclusion status of the local polling venues. Members of the population that are not accessing the venues at the time of polling will be excluded from this convenience sample.

### **Recruitment Procedures**

Participants will be recruited by their association with Kentucky Appalachian LHDs and churches that are located in two different counties. These venues were selected as data collection sites because they offer a participant control that was lacking in other data collection sites that were possibly available. These venues serve their immediate community, which range in size to a few hundred to a few thousand inhabitants. It is

unlikely that anyone from outside the immediate communities would have any interest in the workings of the included local venues, and so the risk of having participants that are not representative of the area of interest included in this study is low to nonexistent. I have obtained preliminary permission to poll where I will simultaneously distribute and collect paper survey-based data. Official permission and appointment dates will be obtained after IRB approval to do so. The participant pool will include adults conducting visits at the included LHDs and churches, as well as any adult family/spouses/community members that may be in attendance with them. The survey itself will be anonymous with no identifying demographics recorded. There will be no way to link any one set of survey answers to any one person after survey completion. The projected data collection timeframe is three to four weeks.

### **Sample Size**

A proper sample size is essential to ensure enough responses to provide accurate results but to also minimize the risk of too many samples that may use up unnecessary and valuable resources (Bartlett, Kotrlik, & Higgins, 2001; Smith, 2013). There are many ways to calculate the projected needed sample size to ensure accurate results, however these require the reporting of the total population of interest. This brings an ethical concern to my study in that by reporting the population of my included counties, it would be then be possible to identify which two counties and locations that were used in this study. This could lead to possible identification of the included participant pool which would be a direct violation of my participant's privacy.



When determining a sample size, a researcher needs to take into account many aspects of their planned study design. These include the research questions and the design of the study, as well as aspects such as time, available resources, how participants will be recruited, and projected response rate (Onwuebuze & Collins, 2007; Scott, n.d.). A researcher also needs to predetermine statistical guidelines such as level of significance, the statistical power, and effect size that are being used as these can influence the sample size as well (Onwuebuze & Collins, 2007). The study design that I am implementing involves utilizing local venues and distributing and collecting surveys in person, so I anticipate a higher response rate than if I were using an electronic survey or distributing the survey through the mail system. Time and available resources are definite factors into my study as both are limited. My statistical guidelines have been set as follows:

*Level of significance ( $\alpha$ ):* The probability of rejecting the null hypothesis when it is true, or a false positive also known as a Type I error. This value is set at 0.05, which is the value that is most widely used and accepted in research studies (Laerd Statistics, 2013c; Onwuegbuzie & Collins, 2007; Scott, n.d.).

*Statistical power:* Determined by the value of  $\beta$  which is the probability of failing to reject a false null hypothesis, or a false negative also known as a Type II error. The value of  $\beta$  has been set at 20%. With power being calculated by  $1 - \beta$ , this sets the power of my study at 80%. This is the probability that I will successfully reject the null hypothesis. Again, these are very common values that are widely used and accepted in research studies (Cohen, 1992; Onwuebuze & Collins, 2007; Scott, n.d.).

*Effect size:* Effect size refers to the magnitude of the difference that may be found between two groups. This value has been set at 0.5, which is considered to be a moderate effect size and commonly used (Scott, n.d.; Sullivan & Feinn, 2012).

My study design contains descriptive aspects but is also correlational in nature as it serves to both gather data that describes how the target population feels about certain aspects of their dental health as well as examining for any relationships that may exist between variables of interest. With this study design and the standard statistical guidelines that have been set, Onwuebuze & Collins (2007) maintain that 82 samples is an appropriate sample size for meaningful results. With these findings, my target sample size is 100, which will encompass the recommendations of Onwuebuze & Collins (2007) while staying within my resource limit and protecting the privacy of my participants.

### **Participation Procedures**

Before gathering data, a researcher must first educate their participants on the fundamental reasoning behind the study as well as obtaining permission from each participant to include them in the study pool. This process is referred to as informed consent. Typically, the informed consent consists of a form detailing such points as explanation of the research purposes, expected duration of the study, along with a description of the procedures that are included in the study (U.S. Department of Health & Human Services, 2016). These forms are then signed by the participant as an acknowledgement that they consent to be included in the study. However, there are cases where a typically signed informed consent form is not needed in order to conduct a study.

Two commonly accepted reasons for not collecting a signed consent form from each participant include (University of Tennessee, 2017):

1. The informed consent would be the sole record linking the participant to research data and so could lead to a breach of confidentiality.
2. The research study presents minimal to no risk of harm to the participants.

The study presented here fulfills both requirements as to not use a traditional informed consent form as this would be the sole record linking the participants to the study, and being survey based this study presents minimal risks to the included participants. Instead of the consent form, each participant will be provided a cover letter before being allowed to take the survey. This cover letter will briefly describe the reason for the study, their role as a participant, reiterate that their answers are completely confidential, and my contact information in case there are any questions or concerns that arise after survey completion. This cover letter will be theirs to keep. Additionally, the first item on the survey will be 'I know that I am volunteering to take part in a research study'.

Each participant must check an answer of 'yes' to this item in order to continue with the survey.

### **Data Collection**

Over a data collection period of three to four weeks, at each local venue that is included, I will personally hand out each survey and be available for any questions regarding the instructions that each participant may have. A small table will be set up in a discrete location that will hold extra clipboards with surveys and cover letters attached to each and pencils. Upon completion, each survey will be immediately placed into a folder

for confidential safe-keeping. Participants will exit the study with the completion of the survey. There will be no follow up with participants after the completion of data collection. My contact information will be included in the survey cover sheet which will be also distributed as take home material for all participants. Any questions or correspondence from participants after taking the survey will be answered and resolved.

### **Instrumentation**

The sole data collection instrument being used is a paper-based survey that has been developed and specifically tailored for this study. To begin the survey development process I first determined the research questions and descriptive data that I wished to include in this study. After these were finalized, I tailored the survey to specifically answer these research points while making sure I used as plain language as possible so that the items would be clear and easy to fill out for my population of interest. To keep the survey as short as possible, many of the items will be used multiple times to answer all the different research points. For instance, the survey item '*I floss my teeth every day*' with possible answers of *Never, Rarely, Sometimes, Most of the Time, and Always*, will be used in conjunction with other survey items to answer Research Question 1 as well as Descriptive Item 1:

Research Question 1: Is there an association between the participant's expressed level of oral health literacy and the frequency at which they practice oral hygiene techniques?

Descriptive Item 1: Do Kentucky Appalachian adults' practice oral hygiene techniques at frequencies as recommended by the American Dental Association?

So in this example, the same information will be used to assist in answering how often Appalachian adults are utilizing oral hygiene methods, as well as investigating on if the usage rate changes with their expressed level of oral health literacy.

### **Reliability**

To provide evidence for the reliability of the survey, the method of internal consistency reliability will be utilized. Internal consistency reliability is the method of using multiple versions of the same survey question in order to determine if there is a consistency between the two answers (Trochim, 2006b). For instance, on the survey used in this study, the following two items are asking about the same information just in differing formats:

1. I brush my teeth two times every day.
2. Sometimes I don't brush my teeth every day.

Internal consistency reliability would be demonstrated if these two items pulled similar answers: for instance, someone who answered as 'always' for item one should then answer 'never' to the second item to demonstrate appropriate consistency. Internal consistency can further assist in demonstrating that the data collection instrument is working appropriately.

### **Validity**

Construct validity describes how well a test actually measures for a particular concept (Trochim, 2006b). In this presented study, the construct being measured would be the level of oral health literacy that each participant expresses by way of answering survey items. The validity here would be in how well the survey items are measuring the

construct of oral health literacy. To measure the construct validity in this study, the method of face validity can be utilized. Face validity is the evaluation of the data collection instrument and deciding if it will work to collect that measures the concept in question (Trochim, 2006c). To do this, the survey will be sent to a selected sample of experts to determine if they agree that the instrument appears to be measuring the construct of oral health literacy correctly. By including multiple experts, such as those who have established experience in research data collection, this ensures that the instrument must gain approval from multiple venues before it is used.

### **Operationalization**

**Independent variable:** *Oral health literacy*. This is defined by the level of oral health literacy that is expressed by participants as determined by how they answer survey items. The items that are being used to evaluate for oral health literacy will provide continuous data for examination. The answers will be ranked on a Likert scale as follows:

Strongly Disagree = 1

Disagree = 2

I Don't Know = 3

Agree = 4

Strongly Agree = 5

**Dependent variable:** *Brushing and flossing frequencies*. This is how often participants report that they brush and floss their teeth. This variable will be determined by how participants answer survey items. The items used to determine this variable

utilize the same Likert scale as described above, and also a second Likert scale as follows:

Never = 1

Rarely = 2

Sometimes = 3

Most of the time = 4

Always = 5

All remaining variables will be measured using these Likert scale formats.

### **Data Analysis Plan**

The software that will be used in the analysis of the collected data for this study is the widely utilized *Statistical Package for the Social Sciences*, or commonly referred to as SPSS. SPSS is a program produced by IBM that will allow for the organization and analytic testing needed to identify any trends in the collected data (IBM Analytics, n.d.). The data collected on the paper surveys will be transferred by me into the SPSS program in order to create the electronic database. During this process, any survey that is found to be incomplete will be eliminated, thereby ensuring a clean and proper final database.

### **Restatement of Research Questions and Descriptive Items**

Research Questions:

1. Is there an association between the participant's expressed level of oral health literacy and the frequency at which they practice oral hygiene techniques?

$H_{a1}$ : There is an association between the participant's expressed level of oral health literacy and the frequency that they practice oral hygiene techniques.

$H_01$  There is no association between the participant's expressed level of oral health literacy and the frequency that they practice oral hygiene techniques.

2. Is there an association between the participant's expressed level of oral health literacy and the frequency at which their children practice oral hygiene techniques?

$H_a2$  There is a relationship between the participant's expressed level of oral health literacy and the frequency that their children practice oral hygiene techniques.

$H_02$ : There is no relationship between the participant's expressed level of oral health literacy and the frequency that their children practice oral hygiene techniques.

3. Are Kentucky Appalachian adults and children practicing oral hygiene techniques at the same frequencies?

$H_a3$ : There is a difference in how often oral hygiene techniques are used between adults and children.

$H_03$ : There is no difference in how often oral hygiene techniques are used between adults and children.

4. Were there differences in the survey responses gathered from the transitional Kentucky Appalachian county and the distressed Kentucky Appalachian county?

$H_a4$ : There are differences in the survey responses collected between the transitional and distressed counties.

$H_04$ : There are no differences in the survey responses collected between the transitional and distressed counties.

Descriptive Items:



1. Do Kentucky Appalachian adults practice oral hygiene techniques at frequencies as recommended by the American Dental Association?
2. Do Kentucky Appalachian children practice oral hygiene techniques at frequencies as recommended by the American Dental Association?
3. Do Appalachian adults perceive dental decay as a health risk?
4. Do Appalachian adults feel that dental decay is a preventable health risk?
5. Do Appalachian adults feel that they can personally decrease the risk of dental decay?
6. Do Appalachian adults perceive oral hygiene techniques as important for good health?
7. To what level do Appalachian adults perceive that enforcing childhood oral health techniques will decrease the risk of dental decay as their children age?
8. Do Appalachian adults perceive poor dental health as a normal event?

### **Analysis Plan**

Traditionally, Likert scale data has been considered to be ordinal in nature in that the answers can be ranked but the actual distance between the answers cannot be measured as they can be highly subjective between participants (Sullivan & Artino, 2013). For example, the distance between answers of ‘completely disagree’ and ‘disagree’ cannot be measured as the exact distance because the meaning of each answer can be different between the included participants. For the purposes of this study, the Likert scale data being collected will be treated as ordinal and so will have non-parametric tests applied for analysis. Non-parametric tests are those that do not make

assumptions about the distribution, unlike parametric tests that assume a normal distribution in the population of interest (Frost, 2016; Sullivan & Artino, 2013). As such, parametric tests such as means and standard deviations will not be computed, but instead I will utilize nonparametric tests such as median, frequencies, and the Mann-Whitney U test to answer the research questions and descriptive items.

To begin the data analysis, I will transfer the collected data into SPSS thereby making an electronic data table. The first calculation that will be performed on the newly created electronic data set is to compute for Cronbach's alpha. In 1951, Lee Cronbach created the Cronbach alpha in order to measure a scale test's internal consistency (Tavakol & Dennick, 2011). Internal consistency is how well all the items included on a test measure a concept or attitude (Tavakol & Dennick, 2011). The better the items on a test demonstrate connectivity, or inter-relatedness, the higher level of validity the test may be said to have. The Cronbach's alpha is expressed by a number that falls between 0 and 1, with values above 0.65 being acceptable (Tavakol & Dennick, 2011; University of Virginia Library, 2017). If the included scale data items are independent of each other, that is, they have no inter-relatedness and share no covariance, then the Cronbach's alpha equals 0 and the test is considered to have no internal consistency (University of Virginia Library, 2017).

Numerically, Cronbach's alpha is defined as:

$$\alpha = \frac{k x \bar{c}}{\bar{v} + (k - 1)\bar{c}}$$

Where alpha includes the average covariance between pairs of items as well as the variance of the total score (University of Virginia, 2017). This calculation will be done using SPSS to reduce the risk of error.

After the data has been tested for inter-relatedness, each survey item will have its median answer calculated by including all corresponding item answers. For instance, all the answers for item 2 will be included in the calculation and this will give a median answer for item 2. The median is the nonparametric equivalent to mean and will give the midpoint answer for each item. As previously discussed, in this study each research question has two or more items associated with it in order to provide more internal consistency. To answer the descriptive items, the composite median score of the included items will be computed. For instance, to answer research question 5:

*'Do Appalachian adults feel that they can personally decrease their risk of dental decay?'*, the medians for three survey items will be included. The composite median of these three median scores will be the answer to research question 5. By computing the median value for each survey item, this will provide information as to the average participant response to each item (Kostoulas, 2014).

Next, the interquartile range (IRQ) will be calculated for each survey item. The IRQ measures how the middle 50% of survey responses are dispersed and will show if the responses are clustered around one answer, or if they are scattered across the possible answers (Kostoulas, 2014; University of Leicester, 2017). To calculate the IRQ the responses for each survey item will be arranged in a ranked-order format, similar to how the data is arranged by magnitude in order to compute the median value. The ordered

responses will then be divided into four equal parts (University of Leicester, 2017). The values that separate each part are referred to as quartiles and these are the values that will be used to calculate the IQR as seen in the following equation:

$$IQR = \text{quartile } 3 - \text{quartile } 1$$

A smaller IQR value will indicate that the responses are more clustered around a particular answer, thereby showing a more unified consensus among the participant pool (Kostoulas, 2014). However, if the IQR is a larger value, this could suggest that the participants have strong opinions both for and against the survey item (Kostoulas, 2014). The IQR will assist in determining if the median value is an accurate representation of average opinions of the participant pool. A small IQR that is suggesting consensus among the answers supports the median value as an accurate report of how the participants as a whole felt about a particular survey item (Kostoulas, 2014). Conversely, a large IQR value that suggests a wider array of strong feelings both for and against the survey item indicates that the median value is likely not an accurate indicator of the average reported response.

To answer the listed hypotheses, a more in-depth analysis method must be used as each hypothesis requires that a correlation be investigated for between a dependent and independent variable. If a correlation between the two variables can be established, then the null hypothesis is rejected, thereby providing an answer to each hypothetical query. To do this, the Spearman rank-order correlation, also referred to as Spearman's correlation, will be used. The Spearman correlation is a nonparametric test that measures the magnitude and direction of an association that is suspected to exist between two

ordinal variables (Laerd Statistics, 2013a). The Spearman correlation test produces a correlation coefficient that can determine the strength of the association between the two variables of interest. A correlation coefficient of .50 and above is read as a strong association between variables, with .29 and below being considered a weak association.

The previously discussed tests of Cronbach's alpha, median values, interquartile range, and Spearman's correlation will all serve to provide information on the attitudes and habits the included Appalachian participants hold towards dental health and care, and thereby answering the main research questions and descriptive items. A further test will be done that evaluates for any differences in survey responses based on the location where each survey was completed. In this study, surveys are being offered in a transitional Appalachian county (County A) and a distressed Appalachian county (County B). To complete these calculations, the Mann-Whitney U test will be utilized. The Mann-Whitney U test is a nonparametric test that is comparable to the parametric independent samples t-test and that can compare and identify differences between two independent groups (Laerd Statistics, 2013b). For the Mann-Whitney U test, the data from each survey item will serve as the ordinal scale dependent variables, while County A and B designations will serve as the independent grouping variables. The Mann-Whitney U test calculations will be completed by SPSS. These calculations will provide a Ranks table that will display the mean rank and sum of ranks between the two groups of participants (Laerd Statistics, 2013b). This will show if there are differences per survey item based on county designation. SPSS will also generate a Test Statistics table as part of the Mann-Whitney U test function. This table will provide the U statistic and the *p*-value, both of

which are used to determine if the mean ranks are significantly different from each other (Laerd Statistics, 2013b). If there are significant differences found, this implies that people are answering an item differently based on county designation.

### **Threats to Validity**

#### **External Validity - Threats**

External validity refers to how well the findings of a study can be applied and used as generalizations towards other people, places, and times that were not included in the study (Steckler & McLeroy, 2008; Trochim, 2006d). Threats to external validity are any that reduce a study's generalizability of its results (Laerd Dissertation, 2012a).

External validity threats are found as two specific categories: ecological validity and population validity (Andale, 2016; Michael, n.d.). Ecological validity is how well the results can be generalized across settings or places that were not included in the study. Most types of ecological validity threats involve the use of pre-testing or education that may interfere with how participants respond to the study's experimental treatment, thereby reducing the generalizability of the results to a population that does not have the pre-test or education (Andale, 2016; Michael, n.d.; University of Minnesota, 2017).

These types of threats will not affect the validity of my study as no pre-testing or education is being provided before data collection. However, ecological validity also includes the threat of reactive effects of experimental arrangements, also known as the Hawthorne effect. The Hawthorne effect describes how the knowledge of participating in a research study may impact the answers or behavior of the study participants (McCambridge, Witton, & Elbourne, 2014). Knowing that they are being researched may

influence a participant to answer how they think they *should* answer as opposed to providing an answer that more accurately portrays their opinion or feelings on a subject. My study will be at risk from the Hawthorne effect as it is impossible for my included participants to not know that they are taking part in a research study and so this will be reported as a threat against the generalizability of my findings.

Population validity refers to the extent that the included study participants are accurate representations of the population of interest (Ferguson, 2004; Michael, n.d.). An appropriate participant pool is essential for generalizable results as population validity is seen as a key threat to the overall external validity of a study (Ferguson, 2004). The random selection of participants is largely viewed as the best method of obtaining a sample of participants that represent the population of interest and produces the highest result generalizability, particularly in quantitative styled studies (Ferguson, 2004; Onwuegbuzie & Collins, 2007). However, Leech & Onwuegbuzie (2002) maintain that in actuality, the majority of quantitative studies utilize non-random sampling techniques and that these non-traditional methods allow researchers more options and opportunities when selecting study participants. For my study, participants are included based on their attendance of local venues that are located in counties that are designated as Appalachian. The benefits of using these venues are as follows:

1. These venues are located in the area of interest.
2. These venues do not bring bias to the study such as would happen if for example, county fairs were used as data collection points.

3. These venues are frequented by people who live and work in the immediate area that the venues serve, thereby allowing me to reach the population of interest, even in rural and more remote areas.
4. Using these venues will allow for direct access to Appalachian adults while providing assurance that people from outside the area of interest will not be involved in the study as it is unlikely that anyone outside the immediate service district will use these venues.

Other than the Hawthorne effect, there are very little to no other threats to the external validity of my study. This means that my results may be able to be used as generalizations for similar people or places that were not included in this study.

### **Internal Validity - Threats**

While external validity refers to the generalizability of the results beyond the scope of the study, internal validity is concerned with how well the concepts of interest are actually measured, particularly in studies where associations or relationships are being established (Kimberlin & Winterstein, 2008; National Business Research Institute, 2017; Trochim, 2006e). Another way of describing internal validity is that it is the extent to which a study's results are related to the independent variable of interest, as opposed to some other variable. Internal validity is closely related to the reliability of a study (Kimberlin & Winterstein, 2008). However, while validity requires that a data collection instrument such as a survey be reliable, the instrument can be reliable without being valid (Kimberlain & Winterstein, 2008).



Threats to internal validity are mainly a concern with studies that are investigating for cause-effect relationships and are usually not relevant in observational or descriptive studies (Trochim, 2006e). The study presented here follows a primarily descriptive format in that its prime focus is to evaluate for the opinions and attitudes health towards oral health and the participants are being polled only one time with no experimental treatment. As such, most of the types of internal validity threats such as maturation, mortality, and contamination effect are not applicable to my study. However, two types of threats could exist in my study. The first of these is referred experimenter effects or bias (Laerd Dissertation, 2012b). This type of threat to internal validity occurs when the researcher somehow influences the choices made by the participants during the study and so makes the resulting data biased and unreliable (Laerd Dissertation, 2012b). Even if these researcher effects are unintentional, they can still lead to incorrect results. While experimenter or researcher effects are more likely to be found in qualitative research that may involve longer face-to-face interviews between researcher and participant, I still need to ensure I reduce the risk of this threat in my quantitative study. To do this, I need to be clear about the survey directions and the point that there are no wrong answers to be found in the survey, that it is indeed strictly measuring only opinions. I also need to be careful when addressing each participant so that I don't unintentionally lead to them to answers they think I may be looking for to answer my research questions. To accomplish this, I believe it will be most effective to not speak of the contents of the survey with any of the participants. For example, if I am asked for direction clarification, I will use an example question that is unrelated to oral health to explain the procedure.

Another threat to the validity of my study is subject effects, which is also referred to as participant reactivity (Laerd Dissertation, 2012b). Participant reactivity is similar to the previously discussed Hawthorne effect, but deals more with how participants will actually change their behavior when taking part in a research study. This change in behavior could possibly influence how participants respond to my survey. However, I am reducing the threat of subject effects by surveying my participants in an environment that is familiar and less staged for them. If I were to conduct my survey in a lab or a location that is new to my participants, I would increase the risk of behavior change in my participants because it may increase the feelings of being scrutinized, examined, and unease towards being in an unfamiliar location (Laerd Dissertation, 2012b).

### **Construct – Threats**

Out of the threats that can occur against the construct validity of a study, my study may be at risk of inadequate preoperational explication of constructs. More simply, this term refers to how an idea or concept that is being evaluated as a construct has not been properly defined to adequately explain what the researcher means (Strauss & Smith, 2009). To avoid this threat to the construct validity of this study, I have been clear in my definitions of the concepts that are included in my study. These include the independent and dependent variables, as well as conceptual ideas and theories such as oral health literacy.

Another threat to the construct validity of this study falls under the category of mono-method bias. Mono-method bias is when bias is introduced into a study's results due to using only one measurement method (Laerd Dissertation, 2012c; Strauss & Smith,

2009). In this study, I attempt to discover the current dental health status of my participants by using survey items designed to develop a self-perceived dental health status of the included participants. This may introduce bias into my study as this is the only form of dental health status establishment that I am including. If I were to utilize multiple methods of data collections, such as survey items along with dental health records, I may end up with a very different overall dental health status of the participant pool than by just using survey items alone. However, it is beyond the scope of this study to include any other methods, such as dental health record collection and analysis, other than the survey instrument. Mono-method bias will be reported in the results as a possible threat to the construct validity of this study.

### **Statistical Conclusion Validity – Threats**

Statistical conclusion validity is how well data can be regarded as accurately identifying an association, or lack of, between independent and dependent variables (as reported by Garcia-Perez, 2012). In a quantitative study, the statistical conclusion validity is threatened when inadequate statistical analysis methods are conducted on the results (Garcia-Perez, 2012). Not using enough variety of or improper statistical analysis methods can yield results that are not accurate (Garcia-Perez, 2012). To reduce the threat of statistical conclusion validity, researchers should thoroughly examine a wide variety of statistical analysis methods and select to use as many that are deemed appropriate in order to fully analyze the resulting data (Garcia-Perez, 2009; Milligan & McFillen, 1984). After much researching of survey-based data analysis methods, I have selected to use multiple analysis methods to include Cronbach's alpha, median values, answer

frequencies, Spearman correlations, and the Mann-Whitney U test. By utilizing as many appropriate statistical analysis methods as possible, my data will be thoroughly analyzed which will reduce the threat to the statistical conclusion validity and also reduce the risk of Type-I and Type-II errors in my results.

## **Ethical Procedures**

### **Institutional Permissions**

IRB approval through Walden University was obtained before data collection was conducted in this study. The IRB number for this study was 12-29-17-0078647.

### **Ethical Concerns**

The main ethical concern that has been present in this study is keeping the identity of the participants anonymous. This study will mimic other studies that have conducted research in the Kentucky Appalachian region in that the included county names or exact polling locations will not be named in this dissertation (Dawkins et al, 2013; Ludke et al., 2006; Savage et al., 2014).

One of the statistical analysis methods that I will utilize on the resulting data involves comparing the survey answers from County A to the results of County B. To achieve this, each survey will be numbered and I will keep a record of which survey numbers were handed out in each county. This will be the only use of the survey numbers and they will not be linked to the actual participants in any way. This record will only be seen and utilized by me and I will keep it along with other sensitive study information.

### **Data Type and Storage**

Due to my plans of comparing data between the two counties based on their economic rankings, it will be possible for me to identify which survey came from each county. However, it will be impossible to tie any one survey to a single person and therefore my data is anonymous in nature. This assurance will assist in alleviating any concerns my participants may have about the protection of their privacy when responding to the survey.

Data collection will be completed by using paper surveys. The data will be transferred into SPSS in order to create an electronic data base that can then be used for analysis. The paper surveys will be kept in a secured and locked drawer of my desk that is located in my home. Only I have access to the key and only I will have access to both the paper surveys as well as the electronic data base. These paper surveys will be kept secure for a period of five years after which they will be destroyed by being mechanically shredded and offered for recycling. The electronic data base will be strictly accessed only by me and only from my home desktop computer, which is password protected and where I am the only user. No other people will have access to the data contained in the electronic database. All documents pertaining to my dissertation, including the electronic database created from the survey responses, will be kept saved on my personal hard drive with a back-up copy saved on my personal Google Drive. The electronic version of my dissertation will be kept indefinitely on my personal home computer and my Google Drive.

**Compensation**

There is no compensation being offered to people who chose to participate in this study.

**Summary**

The presented study utilizes a quantitative study design as numerical data will be collected. The data will be gathered by using paper-based surveys that contain items to be answered by closed-ended Likert scale options. The electronic Likert scale data set will be analyzed using several statistical techniques in order to provide answers to the research questions, hypotheses, and to identify any outstanding trends that may emerge from the included participant pool. Participants will be invited to take part in a drawing which will provide compensation at a rate that cannot be considered coercion to take part in this study. No one participant will be able to be identified with any one particular survey response: the anonymity of the study is protected. All data will be kept securely in my home where only I will have access to any records, including the paper surveys and resulting electronic data base. The electronic version of all data pertaining to this dissertation will be kept indefinitely on my own personal, secured computer hard drive and backed up on my personal; pass-word protected Google Drive

## Chapter 4: Data Analysis

### **Introduction**

The purpose of this study was to evaluate for a relationship between the overall levels of expressed oral health literacy and how often people in Kentucky Appalachian areas utilize oral hygiene techniques. Additionally, this study also serves to give a descriptive overview into how people in Kentucky Appalachian areas may feel towards dental health and how it pertains to them. At the time of this writing, little to no established data could be found that serve to describe or document the attitudes or beliefs that Appalachian Kentuckians hold towards these concepts. Lastly, an investigation is conducted to determine if there are differences in responses based on their national county ranking. As previously discussed in the literature review section of this study, counties across the United States hold a national ranking position that is used to indicate each county's economic status. Counties holding the rank of transitional are considered to be transitioning from weak economies to strong, or vice versa, and make up the worst 25 to the best 25 percent of the nation's counties. Counties that are ranked as distressed make up the worst 10 percent of the nation's counties and so indicate that these are the most economically distressed areas. The study presented here included participants from one distressed and one transitional Kentucky Appalachian county.

As a review, the following research questions, hypothesis, and descriptive items have been developed. Details of how the included variables and concepts were operationalized, as well as the statistical analysis used for each inquiry will be provided later in this chapter.

Research questions:

1. Is there an association between the participant's expressed level of oral health literacy and the frequency at which they practice oral hygiene techniques?

$H_a1$ : There is an association between the participant's expressed level of oral health literacy and the frequency that they practice oral hygiene techniques.

$H_01$ : There is no association between the participant's expressed level of oral health literacy and the frequency that they practice oral hygiene techniques.

2. Is there an association between the participant's expressed level of oral health literacy and the frequency at which their children practice oral hygiene techniques?

$H_a2$ : There is a relationship between the participant's expressed level of oral health literacy and the frequency that their children practice oral hygiene techniques.

$H_02$ : There is no relationship between the participant's expressed level of oral health literacy and the frequency that their children practice oral hygiene techniques.

3. Are Kentucky Appalachian adults and children practicing oral hygiene techniques at the same frequencies?

$H_a3$ : There is a difference in how often oral hygiene techniques are used between adults and children.

$H_03$ : There is no difference in how often oral hygiene techniques are used between adults and children.



4. Were there differences in the survey responses gathered from the transitional Kentucky Appalachian county and the distressed Kentucky Appalachian county?

$H_a4$ : There are differences in the survey responses collected between the transitional and distressed counties.

$H_04$ : There are no differences in the survey responses collected between the transitional and distressed counties.

Descriptive Items:

9. Do Kentucky Appalachian adults practice oral hygiene techniques at frequencies as recommended by the American Dental Association?
10. Do Kentucky Appalachian children practice oral hygiene techniques at frequencies as recommended by the American Dental Association?
11. Do Appalachian adults perceive dental decay as a health risk?
12. Do Appalachian adults feel that dental decay is a preventable health risk?
13. Do Appalachian adults feel that they can personally decrease the risk of dental decay?
14. Do Appalachian adults perceive oral hygiene techniques as important for good health?
15. To what level do Appalachian adults perceive that enforcing childhood oral health techniques will decrease the risk of dental decay as their children age?
16. Do Appalachian adults perceive poor dental health as a normal event?

The remainder of Chapter Four will discuss the process of data collection, results of each research question and descriptive item, and will finish with a summary of the main trends that were identified in the collected data.

### **Data Collection**

As previously discussed throughout the proposal of this study, the protection of the identity of the included participants was an utmost priority. This can be difficult to achieve when using very rural polling venues such as were used in this study. After consideration, it was decided that actual county names or polling venue names would not be included in this study. This follows the privacy methods utilized by Ludke et al. (2006), Dawkins et al. (2013), and Savage et al. (2014). These researchers all conducted studies in Kentucky Appalachian areas and omitted any references to exact areas or locations in which their data was collected. To this end, the transitional county included in this study is referred to as County A and the included distressed county is designated as County B. This fully protects the identity of the included participants, polling venues, and the officials who gave permission to poll at the venues.

The time frame of data collection stretched over a span of roughly four weeks. Data collection in County A took place over a span of three weeks in which two different events were attended and were used as data collection venues. Data collection in County B took place over two days in which one specific community venue was used for polling.

One discrepancy from the data collection plans presented in chapter three was that local fire departments (FDs) were not able to be obtained as polling venues, largely due to a lack of interest in local FD staff. Instead, local health departments (LHDs) and

churches were used as polling venues. These venues presented the same population control parameters as local FD's as both LHD's and churches are mainly utilized by people in the more immediate surrounding area. By choosing venues located in areas of interest, i.e. counties that are designated as transitional and distressed, I was able to ensure I did not include participants that were not representative of my population of interest.

Although the actual polling places had to be changed, the fundamental concept of comparing responses from a transitional county against the responses gathered in a distressed county did not. As of the Fiscal Year 2018 County Economic Report published by the Appalachian Regional Commission, there are three Kentucky Appalachian counties that have the rank of transitional (Appalachian Regional Commission, 2018). The remaining 51 counties that make up the Kentucky Appalachian region are ranked as at-risk or distressed: no counties in this area have the highest rankings of competitive or attainment. County A that was included in this study is one of the three counties with the ranking of transitional. This ranking indicates that County A has a higher level of average economic status and education but that there may be pockets of people present that may be living at economic levels lower than the national poverty level. County B that was included in this study has the ranking of distressed, indicating that people in this county are living in one of the country's most economically poor areas. The demographics of both counties included in this study were investigated to ensure they fully fit the criteria of this study. Although exact numbers cannot be reported here due to the possibility of identifying the included counties and participants, particularly as there are only three

counties in the transitional status, general demographics can be remarked upon to demonstrate that the included counties are representative of the population of interest. County A was found to have over four times the population of County B, however nearly 40% of the population of County B was found to be enrolled in Medicaid, compared to County A which was under 20% (Kentucky Health Facts, 2018). The median household income of County A is higher than County B by nearly \$15,000. The estimated median income between County A and County B was \$31,300. Twenty-six percent of the respondents from County A reported a yearly income below \$31,300 while 41% of the respondents from County B reported the same. County A has nearly five times the number of practicing dentists than that of County B. County A has an 11% increased high school graduation rate over County B. These general demographics all demonstrate that the included counties are representative of the Kentucky Appalachian area of interest as defined by the included counties national rankings of transitional and distressed.

To obtain participants from the included counties, the convenience sampling method was utilized. This included the polling of naturally occurring groups of people visiting selected venues located in the included counties. Population control was supplied by only selecting venues that weren't likely to be utilized by people outside of the area of interest, such as churches and local health departments. While the entire population did not have the chance to participate in this study, the convenience sampling method allowed for obtaining participants that are representative of the larger population of interest (Research Methodology, 2018).

## Results

In this section, the results of the data analysis are presented. First background behind the statistical analysis tests that were used is discussed, and next the computed data is presented with a discussion of the results following. Effort was made to ensure that multiple Likert type items asked about the same factor were included instead of relying on a sole item to answer any particular research question. In this way, a Likert scale construct was created for each factor of interest.

This study involved the use of Likert type survey items where the participants could choose the answer that best fit their opinion of each statement. At the time of this study, no previously developed questionnaire designed to investigate the concepts of interest held by this study could be found for use. As such, a questionnaire was developed specifically for use in this study (See Appendix for the survey items that were developed and used for data collection).

There is a long standing, continuing debate between using parametric or non-parametric methods when analyzing Likert type items or scales (Carifio & Perla, 2008). This largely stems from the differing opinions on whether or not Likert type items and Likert scales should be treated as ordinal or interval data (Allen & Seaman, 2007; Carifio & Perla, 2008; Murray, 2013). For the purposes of this study, the Likert type items and resulting Likert scales were treated as ordinal data and thus non-parametric analysis methods were utilized. This choice was largely made due to this study involving a survey in which people recorded their opinions on various items and so the distributions may not

have been normal, which is an assumption of parametric testing methods. Non-parametric testing methods make no assumptions about the distributions.

Being non-parametric in nature, the Cronbach's alpha value was included as it is the most widely and frequently used method of testing the internal consistency of the Likert type items included in each Likert scale (Gadernann, Guhn, & Zumbo, 2012; Tavakol & Dennick, 2011). Upon calculation, most of the Cronbach's alpha values were found to be subpar, i.e., below what is considered the acceptable value range of 0.60 to 0.90 (Tavakol & Dennick, 2011). After further investigation, it was discovered that Cronbach's alpha isn't always a dependable measure of a scale's internal consistency and can lead to misinterpretation of or even wrongly discarding survey results (Sijtsma, 2009; Tavakol & Dennick, 2011). The Cronbach's alpha value decreases as the skewness of the scale items increases (Gadernann et al., 2012). This means that for survey scales that do not have a clear consensus of answers, meaning that participant responses are scattered among all the answer choices, the alpha will decrease. Many of the Likert type items and thus the resulting Likert scales included on the survey used in this study obtained scattered response patterns, indicating skewness and thus producing lower Cronbach alpha values. This drawback of Cronbach's alpha was demonstrated when calculating the value for Descriptive Item 2: 'Do Kentucky Appalachian children practice oral hygiene techniques at frequencies as recommended by the American Dental Association?'. The 28 responses that indicated that the participant had no children were removed from the data table and a Cronbach's alpha value of .544 was obtained from the remaining 71 responses. Out of curiosity the 28 removed responses were added back into the data table

and the resulting Cronbach's alpha jumped up to .921. On face value, the second alpha of .921 would be much more acceptable, however, it is taking into consideration the 28 participants who responded the same with no children. In actuality, including these 28 participants changed the distribution of the answers in a way that is not truly representative of the data: participants who responded as having no children should not be included in items that ask about children's oral hygiene habits. An additional trend was identified in items that had IQR values of 1.5 or higher, indicating more uneven distribution in the responses, were the items that had the lowest Cronbach's alpha values. This further supports that Cronbach's alpha may not be an appropriate internal consistency measurement when evaluating an opinion survey. Although Cronbach's alpha was possibly found to be a non-reliable method of measuring for internal consistency in this study, the values are still reported for each appropriate item. This is due to the fact that Cronbach's alpha is still the most frequently used value and the alternatives for assessing reliability aren't as well known, nor were they found to be readily calculable using available software such as SPSS. Instead, lower values of Cronbach's alphas were accepted and much focus was given to the ratio of answers for each survey item to identify any trends.

### **Research Questions and Descriptive Items Data Analysis**

In this section the statistical analysis is shown for each of the research questions and descriptive items included in this study. It is divided by each research question and descriptive item with all included survey data for each being listed and the corresponding analysis immediately following (refer to Appendix for the survey items that were used in

this study). For analysis purposes, all survey item answers were assigned a numerical value. For instance, the survey item statement ‘I floss my teeth every day’ had numerical scores assigned to each of the answer choices as follows: 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Most of the time, 5 = Always. A participant choosing to answer this statement with ‘sometimes’, had a score of 3 recorded for this survey item. In this way each participant’s responses were converted to numerical data for analysis and allowed for the ordinal data to be ranked as the numerical values imply a ‘greater than’ relationship. For the corresponding reverse survey items, the scores were reversed. From the example used above, the corresponding reverse survey item was ‘Sometimes I am just too busy to floss my teeth every day’. The answer choices for this item were scored as follows: 1 = Always, 2 = Most of the time, 3 = Sometimes, 4 = Rarely, 5 = Never. In this way, each concept that was investigated did not rely on a sole survey item and the scores for each item correctly aligned to the response choices. Single Likert items used alone are considered to be less valid and less reliable than Likert scales that are composed of multiple items, particularly when measuring perceptions people may hold towards a concept of interest (Warmbrod, 2014).

As demonstrated, multiple survey items were utilized in order to create Likert scales that were specifically designed for each inquiry contained in this study. A total composite score for each participant was calculated by finding the median of the numerical values for all of their responses to the survey items included in each Likert scale. For each separate Likert scale used in this study, care was taken to ensure that all included Likert-type items had the same range of answer choices. For instance, when



creating the Likert scale for investigating how often participants utilized oral hygiene methods, only items that had answer choices of ‘never’ ranging to ‘always’ were included in the Likert scale. No items with answer choices of ‘strongly disagree’ ranging to ‘strongly agree’ were used. This allowed for the total composite scores to be inferred the same way as the individual Likert-type items: a total composite score of 4 or 5 indicated that that participant utilized oral hygiene methods more often than participants with total composite scores of 1 or 2. The use of total composite median scores also allowed for the reporting of the central tendency of the answer responses where appropriate throughout the data analysis process.

Presented first are research questions one and two, in which similar statistical analysis methods were utilized in order to answer each by way of rejecting or failing to reject each associated null hypothesis. Lastly, Cronbach alpha values and Spearman’s correlation coefficients were computed for each question. Considering these results in their entirety allowed for answers to be obtained for the first two research questions as follows.

Research Question 1: Is there an association between the participant’s expressed level of oral health literacy and the frequency at which they practice oral hygiene techniques?

$H_a1$ : There is an association between the participant’s expressed level of oral health literacy and the frequency that they practice oral hygiene techniques.

$H_01$ : There is no association between the participant’s expressed level of oral health literacy and the frequency that they practice oral hygiene techniques.

To determine the variable of expressed oral health literacy, multiple survey items that investigated for several concepts were included. These included concepts were how Kentucky Appalachian adults perceive dental decay as a health risk, if they felt dental decay is a preventable health risk, and if they felt they could personally decrease the risk of dental decay. While no previously established measurement for oral health literacy level could be found, these concepts were included in this study as they mirror concepts that are documented as contributing to a person's overall health literacy level (Helitzer, Hollis, Sanders, & Roybal, 2012). The survey items pertaining to how participants perceived dental decay as a health risk were:

- Having poor teeth can lead to other health problems.
- Having poor teeth can make me sick in other ways.

The included items that investigated for if participants felt that dental decay is a preventable health risk were:

- If parents have poor teeth their kids will too.
- If I brush and floss, I will have good teeth.
- If kids floss their teeth while they are young, they will have better teeth as adults.
- If kids brush their teeth while they are young, they will have better teeth as adults.

And finally, to include if the participants felt they could personally decrease the risk of dental decay the following survey items were included:

- I can only have good teeth if I see a dentist often.

- Kids can only have good teeth if they see a dentist often.

The median values of the responses to each of the above listed eight survey items that made up the Likert scale for oral health literacy were calculated, thereby giving a total composite median score for each participant. These total composite median scores then represented the level of oral health literacy that was expressed by each participant by considering their responses to the included concepts of interest. Using the total composite median scores for each participant produced values that fell between the ranges of 1 and 5. Keeping in that all the included Likert-type items had the same response choices and that ordinal data that has been assigned numerical values implies a ‘greater than’ relationship, it is inferred that a participant who had a total composite score of 5 expressed a higher oral health literacy level than a participant with a total composite score of 1 (Clason & Dormody, 1994; Warmbrod, 2014)..

After establishing the expressed level of oral health literacy for each participant, the frequency at which each participant utilizes oral hygiene techniques was calculated. The following survey items were included to investigate the usage of brushing and flossing:

- I floss my teeth every day.
- I brush my teeth twice every day.
- Sometimes I am just too busy to brush my teeth twice a day.
- Sometimes I am just too busy to floss my teeth twice a day.

Again, a total composite median score was calculated for each participant that included the responses from each of the four included survey items. It is of note that for the

purposes of this study, the definition of proper oral hygiene usage is considered to consist of brushing twice per day and flossing once per day as recommended for proper results by the American Dental Association (2016). Any differences in the reported rates between brushing and flossing are covered later in this chapter. The Cronbach's alpha scores for each construct are as follows:

Table 2

*Cronbach's Alpha Scores for Research Question 1*

| Perceived Risk | Perceived as Preventable | Perceived Self Control | Adult Brush/Floss |
|----------------|--------------------------|------------------------|-------------------|
| 0.424          | 0.522                    | 0.574                  | 0.571             |

The omission of any of the Likert items for brushing or flossing did not increase the reported Cronbach's values.

Using the total composite median scores for each participant, a Spearman's correlation coefficient of 0.039 with a significance value of 0.699 was found. This output indicates a very weak positive correlation between the level of expressed oral health literacy and the frequency at which Kentucky Appalachian adults utilize oral hygiene techniques. This result is not statistically significant as indicated by  $p = 0.699$ . For Research Question 1, the null hypothesis of 'There is no relationship between a subject's expressed level of oral health literacy and the frequency in which they practice oral hygiene techniques' is accepted.

Research Question 2: Is there an association between the participant's expressed level of oral health literacy and the frequency at which their children practice oral hygiene techniques?

$H_{a2}$ : There is a relationship between the participant's expressed level of oral health literacy and the frequency that their children practice oral hygiene techniques.

$H_{02}$ : There is no relationship between the participant's expressed level of oral health literacy and the frequency that their children practice oral hygiene techniques.

The variable of expressed oral health literacy level was already computed as described for Research Question 1. For the dependent variable of oral hygiene technique usage by children, the following survey items were included:

- My kids brush their teeth twice every day.
- My kids floss their teeth every day.
- Sometimes my kids don't brush their teeth every day.
- Sometimes my kids don't floss their teeth every day.

A total composite median score was calculated for each participant that included the responses from each of the four included survey items pertaining to oral hygiene methods used by children. Participants who indicated that they did not have children were not included in this scale. It is again of note that for the purposes of this study, the definition of proper oral hygiene usage is considered to consist of brushing twice per day and flossing once per day as recommended for proper results by the American Dental

Association (2016). Any differences in the reported rates between brushing and flossing are covered later in this chapter. The Cronbach's alpha scores for each included item are as follows:

Table 3

*Cronbach's alpha scores for Research Question 2*

| Perceived Risk | Perceived as Preventable | Perceived Self Control | Child Brush/Floss |
|----------------|--------------------------|------------------------|-------------------|
| 0.424          | 0.522                    | 0.574                  | 0.544             |

The omission of any of the Likert items for this scale did not increase the reported Cronbach's alpha values. Using the total composite median scores for each participant, a Spearman's correlation coefficient of .239 with a significance value of .017 was found. By examining this output, it is determined that there is a weak, positive correlation between the expressed level of oral health literacy and the frequency at which children use oral hygiene techniques,  $r_s = .239$ . This result is statistically significant as indicated by  $p = .017$ . For Research Question 2, the null hypothesis of 'There is no relationship between the participant's expressed level of oral health literacy and the frequency that their children practice oral hygiene techniques' is rejected.

**Research Question 3:** Are Kentucky Appalachian adults and children practicing oral hygiene techniques at the same frequencies?

$H_a3$ : There is a difference in how often oral hygiene techniques are used between adults and children.

$H_03$ : There is no difference in how often oral hygiene techniques are used between adults and children.

For Research Question 3, a Spearman's correlation coefficient like what was used in the first two research questions was not an appropriate method for analysis. To answer this research question the frequencies of how often oral hygiene techniques were reported being used were compared between participants and their children to determine if there were differences between the two groups.

Table 4

*Reported usage of oral hygiene techniques for adults and for children.*

Reported adult oral hygiene usage rate at recommended frequencies.

|                  | N   | Percent | Cronbach's alpha |
|------------------|-----|---------|------------------|
| Never            | 30  | 7.6%    | .571             |
| Rarely           | 76  | 19.2%   |                  |
| Sometimes        | 186 | 47.0%   |                  |
| Most of the time | 81  | 20.4%   |                  |
| Always           | 23  | 5.8%    |                  |

Reported child oral hygiene usage rate at recommended frequencies.

|                  | N  | Percent | Cronbach's alpha |
|------------------|----|---------|------------------|
| Never            | 91 | 32.6    | .544             |
| Rarely           | 76 | 27.2    |                  |
| Sometimes        | 62 | 22.2    |                  |
| Most of the time | 43 | 15.4    |                  |
| Always           | 7  | 2.6     |                  |

Here we see that 73.8% of adults report utilizing oral hygiene techniques at rates of sometimes or less, while 82.0% of children are reported as utilizing oral hygiene techniques at the same rates. However the distributions between the groups are different: there is a higher percentage of children reported as utilizing techniques at rates of rarely or never than adults. For Research Question 3, the null hypothesis is rejected.

**Research Question 4:** Are there differences in the survey responses based on the participant's county of origin, translational County A or distressed County B?

$H_a4$ : There are differences in the survey responses collected between the transitional and distressed counties.

$H_04$ : There are no differences in the survey responses collected between the transitional and distressed counties.

Independent variable: County A and County B groupings.

Dependent variable: Responses to each survey item.

This last research question was developed to determine if any of the survey items were answered differently based on where the survey was filled out, either County A or County B. This would serve to demonstrate if answers varied between the transitional and distressed counties. Here the Mann-Whitney U test was utilized as this test allows for the comparison of differences between two independent groups when the dependent variable is ordinal in nature (Laerd Statistics, 2018).

To use the Mann-Whitney U test, there are four assumptions about the data that must be met (Laerd Statistics, 2018):

Assumption #1: There is one dependent variable that has been measured at the ordinal level. This assumption has been met as this study has variables that have been measured with Likert items which are ordinal in nature.

Assumption #2: There is an independent variable that consists of two categorical, independent groups. This assumption is met in this study as the independent groups consist of the responses gathered from County A and County B.



Assumption #3: There is an independence of observations between the two independent groups. This assumption is met as there were different participants in both county groups. No one participant was included in both groups.

Assumption #4: The distribution of scores of both independent groups needs to be confirmed as being similar or different as this dictates how the results can be interpreted. Using SPSS software, population pyramid charts were generated while calculating the Mann-Whitney U tests. Each population pyramid chart was visually inspected to determine if the two distributions contained in each Mann-Whitney U test were similar or different (Laerd Statistics, 2018). For tests that demonstrated that the distributions were similar, the medians were investigated (Laerd Statistics, 2018). For distributions that were deemed visually different, the mean ranks were taken into consideration instead of looking for differences in the median values (Laerd Statistics, 2018). In this study, U test statistics could run from 0, indicating a complete separation between groups and that the  $H_0$  should be rejected, and 2,438, indicating complete agreement between groups and that the  $H_0$  should be accepted (Boston University, 2017). Overall the deciding factor for each test regardless of distribution was the resulting significance value,  $p$ .

Using SPSS software, the Mann-Whitney U test was used to test the null hypothesis for each item that stated there were no differences in the survey responses collected in County A and County B. The result for each item is as follows with items with different distributions listed with their mean rank scores:

Table 5  
*Mann-Whitney U test results of survey items based on county groups: Retain null*

| Survey Item  | U Statistic | Sig.  | County A mean rank | County B mean rank | Decision |
|--|-------------|-------|--------------------|--------------------|----------|
| 2. I floss my teeth every day.   | 1209        | 0.94  |                    |                    | Retain   |
| 4. Sometimes I am just too busy to brush my teeth twice a day.               | 1094        | 0.338 |                    |                    | Retain   |
| 6. My kids floss their teeth every day.                                      | 1523        | 0.242 |                    |                    | Retain   |
| 7. If I brush and floss every day, I will have good teeth.                   | 1447        | 0.091 |                    |                    | Retain   |
| 11. I have had cavities in my teeth.   | 1095        | 0.328 |                    |                    | Retain   |
| 13. Sometimes I am just too busy to floss my teeth every day.                | 1373        | 0.238 | 47.08              | 53.36              | Retain   |
| 18. As an adult I can still have poor teeth even if I brush and floss a lot. | 1143        | 0.562 |                    |                    | Retain   |
| 19. Kids can only have good teeth if they see a dentist a lot.               | 1230        | 0.934 |                    |                    | Retain   |
| 23. Having poor teeth can make me sick in other ways.                        | 1035        | 0.162 |                    |                    | Retain   |

Table 6  
*Mann-Whitney U test results of survey items based on county groups: Reject null*

| Survey Item  | U Statistic | Sig.  | County A mean rank | County B mean rank | Decision |
|--|-------------|-------|--------------------|--------------------|----------|
| 1. If parents have poor teeth, their children will too.  | 1035        | 0.004 |                    |                    | Reject   |
| 3. Having cavities is a normal part of life.   | 807         | 0.002 |                    |                    | Reject   |
| 5. Having poor teeth can lead to other health problems.  | 632         | 0.002 | 42.2               | 58.99              | Reject   |
| 8. My kids have had cavities in their teeth.   | 449         | 0.025 |                    |                    | Reject   |
| 9. Sometimes my kids don't brush their teeth twice a day.  | 534         | 0.016 | 38.57              | 33.21              | Reject   |
| 10. People are born with either good teeth or bad teeth and they stay that way for their whole life.   | 952         | 0.011 | 56.56              | 42.45              | Reject   |
| 12. I brush my teeth twice every day.  | 817         | 0.002 |                    |                    | Reject   |
| 14. Sometimes having poor teeth just happens and people can't help that.                               | 827         | 0.004 |                    |                    | Reject   |
| 15. I can only have good teeth if I see a dentist a lot.   | 562         | 0.01  | 43.52              | 57.47              | Reject   |
| 16. If kids brush their teeth every day while they are young, they will have better teeth as they age. | 770         | 0     | 39.6               | 61.98              | Reject   |
| 17. If kids floss their teeth every day while they are young, they will have better teeth as they age. | 803         | 0     | 38.98              | 62.71              | Reject   |
| 20. Sometimes my kids don't floss their teeth every day.   | 976         | 0     | 26.61              | 46.22              | Reject   |
| 21. My kids brush their teeth twice every day.   | 875         | 0.003 | 29.35              | 43.24              | Reject   |
| 22. If someone has bad teeth, they can only get better by seeing a dentist.                            | 928         | 0.034 | 55.48              | 43.68              | Reject   |

The significance of these results and how they identify and relate to overall trends are discussed later in this chapter and in Chapter 5 of this study.

### **Descriptive Information**

While this study was driven by four main research questions with corresponding hypotheses, it also served to provide descriptive information into how Kentucky Appalachians perceive several oral health related topics. This data further assists in filling the gap in the currently available literature by providing insight into any trends Kentucky Appalachians may display in how they feel about different aspects of oral health and how it pertains to them. Descriptive data such as the following can assist policy-makers and

public health officials to better understand public perceptions and behavior by providing insight into what issues to focus on when designing public health programs in local communities (Rubin et al., 2014). The following data is comprised of discrete variables, or variables that can only be specific values such as what was obtained on the survey used in this study using Likert type items (Boston University, n.d.; Hussain, 2012). As such, the data was analyzed and trends identified by examining the frequency and percentages of the responses to the corresponding survey items (refer to Appendix for the survey items used in this study).

Much like that was done for each research question, a Likert scale was developed for each descriptive item to avoid depending on any one survey item to provide results. Using SPSS software, the frequencies for each Likert scale were found. As an example, for descriptive item 1 there were four Likert-type survey items used in the corresponding Likert scale and the responses for each item were included in the frequency count to provide an answer to the descriptive item. Any significantly different results between the responses of both counties as found by the Mann-Whitney U test are also discussed. The Cronbach's alpha and IQR are also provided for each Likert scale. The results for each descriptive item are as follows:

1. Do Kentucky Appalachian adults practice oral hygiene methods at recommended rates?

The included survey items asking about oral hygiene rates were:

- I floss my teeth every day.
- I brush my teeth twice every day.

- Sometimes I am just too busy to brush my teeth twice a day.
- Sometimes I am just too busy to floss my teeth twice a day.

After reversing the scores of the last two items, the frequencies for each answer choice were found and the results compared based on the county of origin:

Table 7

*Descriptive Item 1 Results.*

Do adults practice oral hygiene methods at recommended frequencies?

| Response         | n   | Percent | alpha | IQR |
|------------------|-----|---------|-------|-----|
| Never            | 30  | 7.6     | 0.571 | 1   |
| Rarely           | 76  | 19.2    |       |     |
| Sometimes        | 186 | 47      |       |     |
| Most of the time | 81  | 20.4    |       |     |
| Always           | 23  | 5.8     |       |     |

Significant differences found between the responses of County A and County B.

Mann-Whitney U test result

| Survey Item                       | U statistic | Sig.  |
|-----------------------------------|-------------|-------|
| I brush my teeth twice every day. | 817         | 0.002 |

From the data it is evident that 47.0% of the responses were the middle answer of ‘sometimes’. The remaining answers were nearly equally scattered among the remaining answer choices with just a few more reporting an answer of ‘never’ than ‘always’. Here we conclude that Kentucky Appalachian adults are likely not utilizing oral hygiene techniques at recommended frequencies, indicating that they could possibly increase their overall oral health status if frequencies were increased. A significant difference was found in that County A was more likely to respond positively to the statement ‘I brush my teeth twice every day’, however both counties had equally subpar responses to the reverse statement.

2. Do Kentucky Appalachian children practice oral hygiene methods at recommended rates?

Using the following survey items:

- My kids brush their teeth twice every day.
- My kids floss their teeth every day.
- Sometimes my kids don't brush their teeth every day.
- Sometimes my kids don't floss their teeth every day.

Table 8

*Descriptive Item 2 Results.*

Do children practice oral hygiene techniques at recommended frequencies?

| Response         | n  | Percent | alpha | IQR |
|------------------|----|---------|-------|-----|
| Never            | 91 | 32.6    | 0.544 | 1   |
| Rarely           | 76 | 27.2    |       |     |
| Sometimes        | 62 | 22.2    |       |     |
| Most of the time | 43 | 15.4    |       |     |
| Always           | 7  | 2.6     |       |     |

Significant differences found between the responses of County A and County B.

Mann-Whitney U test result

| Survey Item  | U statistic | Sig.  |
|--|-------------|-------|
| My kids brush their teeth twice every day.           | 875         | 0.003 |
| Sometimes my kids don't brush their teeth every day. | 534         | 0.016 |
| Sometimes my kids don't floss their teeth every day. | 976         | 0     |

For this inquiry, no one answer can be pinpointed in the response frequencies as being clearly chosen more often than the rest. However, it is found in that an overwhelming 82.0% of the responses indicate that children are 'sometimes', 'rarely' or 'never' utilizing oral health techniques at recommended frequencies. Further

investigation into the differences between counties demonstrated significant results.

Participants in County B were more likely to respond positively to the statement ‘My kids brush their teeth twice every day’, however they did not express the same trend when answering the reverse statement ‘Sometimes my kids don’t brush their teeth every day’.

County A was more consistent in their answers to both statements. County B participants were more likely to disagree with ‘Sometimes my kids don’t floss every day’, however both counties answered fairly equally with subpar responses to ‘My kids floss every day’.

For this behavioral investigation, it was found that participants in County B were not consistent in their responses. However this data shows that Kentucky Appalachian children are likely not utilizing oral hygiene techniques at recommended frequencies.

### 3. Do Kentucky Appalachian’s perceive dental decay as a health risk?

The following survey items were analyzed:

- Having poor teeth can lead to other health problems.
- Having poor teeth can make me sick in other ways.

Table 9

*Descriptive Item 3 Results.*

Do Kentucky Appalachian's perceive dental decay as a health risk?

| Response         | n  | Percent | alpha | IQR |
|------------------|----|---------|-------|-----|
| Never            | 28 | 14.1    | 0.424 | 1.5 |
| Rarely           | 55 | 27.8    |       |     |
| Sometimes        | 41 | 20.7    |       |     |
| Most of the time | 48 | 24.2    |       |     |
| Always           | 26 | 13.2    |       |     |

Significant differences found between the responses of County A and County B.

Mann-Whitney U test result

| Survey Item  | U statistic | Sig.  |
|--|-------------|-------|
| Having poor teeth can lead to other health problems. | 632         | 0.002 |

A clear answer cannot be determined from the supplied responses. The trend here is that responses are nearly equal across 'strongly agree' and 'strongly disagree' and 'agree' and 'disagree'. This lack of one true response is also evident by the lower Cronbach's alpha value of .424 and a higher IQR of 1.5. This indicates that there is nearly the same number of people that feel that dental decay is not a health risk as there are people who do feel it is a health risk. However, when considering the Mann-Whitney U test results, it was demonstrated that participants in County A were more likely to respond positively to both included items. County B participants were more likely to disagree with both statements, significantly so with 'Having poor teeth can lead to other health problems'.

## 4. Do Kentucky Appalachian adults feel that dental decay is preventable?

The following survey items were included:

- If parents have poor teeth their kids will too.



- If I brush and floss, I will have good teeth.
- If kids floss their teeth while they are young, they will have better teeth as adults.
- If kids brush their teeth while they are young, they will have better teeth as adults.

Table 10

*Descriptive Item 4 Results.*

Do Kentucky Appalachian's perceive dental decay as a health risk?

| Response         | n   | Percent | alpha | IQR |
|------------------|-----|---------|-------|-----|
| Never            | 26  | 6.6     | 0.522 | 1   |
| Rarely           | 77  | 19.4    |       |     |
| Sometimes        | 104 | 26.3    |       |     |
| Most of the time | 149 | 37.6    |       |     |
| Always           | 40  | 10.1    |       |     |

Significant differences found between the responses of County A and County B.

Mann-Whitney U test result

| Survey Item  | U statistic | Sig.  |
|--|-------------|-------|
| If parents have poor teeth their kids will too.  | 1035        | 0.004 |
| If kids floss their teeth while they are young, they will have better teeth as adults. | 803         | 0     |
| If kids brush their teeth while they are young, they will have better teeth as adults. | 770         | 0     |

The trend for this descriptive item is found by looking at the total of responses that indicated agreement or disagreement. Here, 47.7% of the responses indicate agreement that dental decay is preventable opposed to 26% who don't feel that it is preventable. Unfortunately, over a quarter of responses indicated that the participants answered with 'I don't know'. The results are largely significantly different based on the participant's county of origin with more people in County A answering with 'I don't

know' than County B where participants were more likely to agree to all included statements.

5. Do Kentucky Appalachian adults feel that they can personally decrease the risk of dental decay?

Included the following survey items:

- I can only have good teeth if I see a dentist often.
- Kids can only have good teeth if they see a dentist often.

Table 11

*Descriptive Item 5 Results.*

Do Kentucky Appalachian's feel they can personally decrease the risk of dental decay?

| Response         | n  | Percent | alpha | IQR |
|------------------|----|---------|-------|-----|
| Never            | 3  | 1.5     | 0.574 | 1   |
| Rarely           | 29 | 14.6    |       |     |
| Sometimes        | 43 | 21.7    |       |     |
| Most of the time | 96 | 48.5    |       |     |
| Always           | 27 | 13.6    |       |     |

Significant differences found between the responses of County A and County B.

Mann-Whitney U test result

| Survey Item  | U statistic | Sig. |
|--|-------------|------|
| I can only have good teeth if I see a dentist often. | 562         | 0.01 |

The results for the concept of self-control indicate that Kentucky Appalachian adults are more likely to feel that only by seeing a dentist can they decrease the risk of dental decay, although almost 22% answered with 'I don't know'. However, it was found that people in County B were more likely to feel this way over people in County A with their own dental health. Both counties were similar in their disagreement that children can only have good teeth if they see a dentist often.

6. Do Kentucky Appalachian adults perceive oral hygiene techniques as important for good overall health?

To investigate this concept, the following Likert survey items were included:

- If I brush and floss every day, I will have good teeth.
- People are born with either good teeth or bad teeth and they stay that way for life.
- I can only have good teeth if I see a dentist a lot.
- I can still have poor teeth even if I brush and floss often.
- Having poor teeth can make me sick in other ways.

Table 12

*Descriptive Item 6 Results.*

Do Kentucky Appalachian's view oral hygiene as important for overall health?

| Response         | n   | Percent | alpha | IQR |
|------------------|-----|---------|-------|-----|
| Never            | 29  | 5.9     | 0.518 | 1.5 |
| Rarely           | 80  | 16.2    |       |     |
| Sometimes        | 119 | 24      |       |     |
| Most of the time | 198 | 40      |       |     |
| Always           | 69  | 13.9    |       |     |

Significant differences found between the responses of County A and County B.

Mann-Whitney U test result

| Survey Item  | U statistic | Sig.  |
|--|-------------|-------|
| People are born with either good teeth or bad and they stay that way for life. | 952         | 0.011 |
| I can only have good teeth if I see a dentist often.                           | 562         | 0.01  |

It was found that 53.9% of the collected responses indicated that they agreed that oral hygiene techniques are important for overall health. However, this left roughly 46.0% of the participants as either not knowing or disagreeing. County A participants were

significantly more likely to respond with ‘I don’t know’ to the item ‘People are born with either good teeth or bad teeth and they stay that way for life’, while again, County B participants were more likely to indicate that they believe proper oral health can only be achieved by seeing a dentist often.

7. To what level do Kentucky Appalachian adults perceive that enforcing childhood oral hygiene techniques will decrease the risk of dental decay as their children age?

Using the following Likert type survey items:

- If kids floss their teeth while they are young, they will have better teeth as adults.
- If kids brush their teeth while they are young, they will have better teeth as adults.

Table 13

*Descriptive Item 7 Results.*

Do adults perceive that proper childhood oral hygiene leads to better lifetime oral health?

| Response         | n  | Percent | alpha | IQR |
|------------------|----|---------|-------|-----|
| Never            | 4  | 2       | 0.661 | 1   |
| Rarely           | 24 | 12.1    |       |     |
| Sometimes        | 51 | 25.8    |       |     |
| Most of the time | 96 | 45.5    |       |     |
| Always           | 23 | 11.6    |       |     |

Significant differences found between the responses of County A and County B.

Mann-Whitney U test result

| Survey Item  | U statistic | Sig. |
|--|-------------|------|
| If kids floss their teeth while they are young, they will have better teeth as adults. | 803         | 0    |
| If kids brush their teeth while they are young, they will have better teeth as adults. | 770         | 0    |

The responses indicate that overall, more people feel that oral health techniques do help children to decrease their risk of dental decay as they age. However, roughly a quarter of the participants included in this study indicated that they don't know if these techniques will help or not. Participants in County B were more likely to agree with both statements while more County A participants responded with 'I don't know'.

8. Do Kentucky Appalachian adults perceive poor dental health as a normal event?

The survey items included for this concept were:

- Sometimes having poor teeth just happens and people can't help that.
- Having cavities are a normal part of life.
- People are either born with good teeth or poor teeth and they stay that way for life.

Upon calculation of the Cronbach's alpha of .183, it was determined that these questions have no correlation to each other and that they do not serve to measure the same factor.

The Cronbach's alpha value is too low and the removal of any of the included items does little to improve the value.

### **Summary**

After analyzing the data for this study, many noteworthy trends emerged from the research questions and supporting descriptive items. Descriptive Item 1 focused on the frequencies that Kentucky Appalachian participants utilized oral hygiene techniques. It was found that adults in both counties are largely not brushing or flossing at frequencies recommended by the American Dental Association. The reported 73.8% of the responses

across both counties indicated that the majority of respondents utilized these techniques only 'sometimes' or less often. By examining the Likert type items included in this scale individually, it was found that the frequency of brushing were higher than frequencies of flossing. Both counties reported equally subpar flossing habits. This indicates that if frequencies of brushing and flossing could be increased, this may assist in reducing the occurrence of poor dental health and disease found in people located in Appalachian areas.

Descriptive Item 2 investigated how often Kentucky Appalachian children utilized oral hygiene techniques. Rates of flossing were not statistically significantly different across the counties. County A had more responses of disagreement to the statement 'Sometimes my kids don't brush their teeth every day' and this was found to be significantly different from County B. However, by examining the ratio of provided answers, 82.0% of the parental responses indicated that their children are utilizing these techniques at frequencies of 'sometimes' or less often. By examining the Likert type items individually, again it was found that rates of flossing were particularly subpar in both counties. This data indicates that the usage of childhood oral hygiene techniques could be improved upon and that much like for adults, this may help in decreasing the rate of poor dental health and disease in children in these areas.

Descriptive Item 3 was formulated to investigate if Kentucky Appalachian adults perceive dental decay as a health risk. The IQR value of 1.5 and a lower Cronbach's alpha value of .424 indicated that the responses were scattered instead of showing a clear pattern. This was indeed true when looking at the response frequencies. When answering

the two statements of ‘Having poor teeth can lead to other health problems’ and ‘Having poor teeth can make me sick in other ways’, 20.7% of the participants answered with ‘I don’t know’. There were slightly more participants who responded with ‘disagree’ or ‘strongly disagree’ than people who ‘agreed’ or ‘strongly agreed’ to these statements. However it was found that County B had more participants who agreed with these statements, with the results for ‘Having poor teeth can lead to other health problems’ being statistically significantly different from County A. One reason for this response pattern might be that people in County B may be more likely to have had firsthand experience of the additional health issues that can result from poor teeth than people in County A. This theory is supported by the fact that County B has almost 2.5 times the rate of tooth loss, defined as the percentage of adults missing six or more teeth, than County A (Kentucky Health Facts, 2018). Localized areas in County B report that over 50.0% of adults suffer from tooth loss.

Descriptive Item 4 investigated to determine if Appalachian adults felt that dental decay is a preventable health risk. People in County B were more likely to agree to the statements of ‘If kids floss their teeth while they are young, they will have better teeth as adults’ and ‘If kids brush their teeth while they are young, they will have better teeth as adults’ and these were statistically significantly different from County A who were more likely to respond with ‘I don’t know’. County A was more likely to disagree with the statement of ‘If parents have poor teeth their kids will too’ and this was statistically significantly different from County B. By looking at the frequencies for the items included in this Likert scale, it was found that 52.3% of respondents either didn’t know or

disagreed with the statement. This led to Descriptive Item 7 which looked at if Kentucky Appalachian adults feel that enforcing childhood oral hygiene techniques leads to a reduced risk of dental decay as their children age. Again, the answers to these included items showed statistically significantly different answers between counties, with County B more likely to respond positively while more people in County A responded with 'I don't know'. Although County B was found to be more likely to respond positively to the statements included in these two related research questions, their answers provided to the items focusing on childhood oral hygiene usage rates indicate that their children actually utilize these techniques at rates lower than County A. Descriptive Item 5 gives more insight into this trend.

Descriptive Item 5 looked into if Kentucky Appalachian adults feel they can personally decrease their risk of dental decay. To the item 'I can only have good teeth if I see a dentist a lot', 78.2% of the respondents in County B were more likely to agree or strongly agree and this result was statistically significantly different from County A. This may assist in explaining the results of Descriptive Items 4 and 7 and the reported poor correlation to oral hygiene frequencies: people in County B may be more likely to see dental decay as a health risk but are more likely to believe that good teeth can only be obtained by seeing a dentist regularly and so may be less likely to utilize oral hygiene techniques at recommended frequencies.

Descriptive Item 6 investigated to see if Kentucky Appalachian adults viewed oral hygiene techniques as being important to overall good health. After examining the frequencies for all five survey items included for this question, it was again found that



County B was more likely to respond as good teeth can only be obtained by seeing a dentist regularly. Overall, 53.9% of responses indicated that oral hygiene techniques are important for good overall health. However, this does leave nearly half of the responses indicating not knowing or disagreeing to this concept. This may be a factor behind the high rate of non-utilization of oral hygiene techniques that was found in Research Question 1. People in the included areas may not be brushing and flossing at rates as recommended by the American Dental Association because nearly half of them don't feel that these techniques are important for overall good health.

As previously identified, Descriptive Item 7 sought to find out if Kentucky Appalachian adults felt that enforcing childhood oral hygiene techniques was important. Overall, it was found that 60.1% of the responses agreed or strongly agreed to this concept. However, the vast majority of the responses of 'I don't know' were collected in County A, which was statistically significantly different from County B. County B was more likely to respond positively to this concept, but again, this isn't reflective in their reported rates of oral hygiene techniques being utilized by their children.

Descriptive Item 8 sought to find out if Kentucky Appalachian adults perceived poor dental health as a normal health event. This question could not be answered in its entirety due to a very low Cronbach's alpha value. All three of the included items that made up this Likert scale were found to have the highest IQR values:

Table 14  
Descriptive Item 8 IQR Percentiles per survey item.

|  |    |      |
|--|----|------|
| 4. Having cavities is a normal part of life.   |    |      |
| Percentiles:   | 25 | 2.00 |
|  | 50 | 2.00 |
|  | 75 | 4.00 |
| 11. People are born with either good teeth or bad teeth and they stay that way for life. |    |      |
| Percentiles:   | 25 | 1.00 |
|  | 50 | 2.00 |
|  | 75 | 3.00 |
| 15. Sometimes having poor teeth just happen and people can't help that.                  |    |      |
| Percentiles:   | 25 | 2.00 |
|  | 50 | 3.00 |
|  | 75 | 4.00 |

This indicates that the responses were scattered across the answer choices and a trend is difficult to pinpoint. This was found to be true when looking at the frequencies for each item:

Table 15

*Descriptive Item & response frequencies.*

4. Having cavities is a normal part of life.

|                   | <u>n</u> |
|-------------------|----------|
| Strongly disagree | 10       |
| Disagree          | 40       |
| I don't know      | 23       |
| Agree             | 22       |
| Strongly agree    | 4        |

11. People are born with either good teeth or bad teeth and they stay that way for life.

|                   | <u>n</u> |
|-------------------|----------|
| Strongly disagree | 25       |
| Disagree          | 35       |
| I don't know      | 28       |
| Agree             | 9        |
| Strongly agree    | 2        |

15. Sometimes having poor teeth just happen and people can't help that.

|                   | <u>n</u> |
|-------------------|----------|
| Strongly disagree | 3        |
| Disagree          | 34       |
| I don't know      | 16       |
| Agree             | 32       |
| Strongly agree    | 14       |

The responses are nearly equal across agree and disagree, with many indicating that they don't know. The only trend from this data that can be identified is that there is no true agreement among the items included in this scale.

The output produced for Research Question 1 suggested a very weak positive correlation between the expressed level of oral health literacy and the frequency at which Kentucky Appalachian adults utilize oral hygiene techniques,  $r_s = .039$ . This result was not found to be statistically significant as indicated by  $p = .699$ . For Research Question 1, the  $H_0$  of 'There is no relationship between a subjects expressed level of oral health literacy and the frequency in which they practice oral hygiene techniques' was retained.

In Research Question 2, it was determined that there was a weak, positive correlation between the expressed level of oral health literacy and the frequency at which children use oral hygiene techniques,  $r_s = .239$ . This result was statistically significant as indicated by  $p = .017$ . For Research Question 2, the  $H_0$  of ‘There is no relationship between a subjects expressed level of oral health literacy and the frequency that their children practice oral hygiene techniques’ was rejected. However, it was found that children are utilizing oral hygiene techniques at frequencies that are much lower than recommended. These results suggest that while a parent’s oral health literacy level may be influencing how often their children brush and floss, it may be that the parent’s overall oral health literacy level may be too low to promote proper oral hygiene technique usage in their children.

The frequency tables that were calculated for Descriptive Items 1 and 2 were utilized to answer Research Question 3. Upon examination of the distribution of responses, it was determined that there was a difference between adults and children in their utilization of oral hygiene techniques. For Research Question 3, the  $H_0$  of ‘There is no difference in the usage rate of oral hygiene techniques between subjects and their dependent children’ was rejected as more children are reported as not using oral hygiene techniques appropriately. As presented in Chapter 1, it is documented that children largely learn health habits and attitudes from their parents, particularly during their first few years of life as they are completely dependent on their caregiver’s for all health related treatments (Rhee, 2008). This documented trend can be seen in the data for Research Question 3: children are not using oral hygiene methods in higher frequencies

than their parents and in fact, the data demonstrated that they are utilizing these methods less often than their parents. This indicates that educational programs designed to assist in improving the transition of dental related knowledge from parent to child may be of use in Kentucky Appalachian communities. It is of note that was found that children have higher rates of teeth brushing, particularly in County B, than flossing; however the reported rates of childhood flossing in both counties were highly subpar to the reported rates of flossing in adults.

Research Question 4 involved the comparison of each survey item based on county A or B response origin. In this way it was determined whether there was a statistically significant difference in responses based on county designation. One trend that appeared during these calculations was that County A was much more likely to respond with 'I don't know'. County B was more likely to have more definitive answers of 'agree' or 'disagree' than to choose 'I don't know' as a response. There were a few interesting differences to note where the  $H_0$  of 'There are no differences in the survey responses collected between County A and County B' was rejected.

For the item of 'If parents have poor teeth, their kids will too', County A was more likely to disagree with this statement than County B. For the item of 'Sometimes having poor teeth just happens and people can't help that', County A was more likely to disagree than County B. This suggests that County B may generally hold a more apathetic acceptance of poor dental health than County A.

Conversely, County B demonstrated a better understanding of how childhood utilization of oral hygiene techniques may decrease the occurrence of dental decay as

children age. For the statements of ‘If kids brush their teeth every day while they are young, they will have better teeth as they age’ and ‘If kids floss their teeth every day while they are young, they will have better teeth as they age’ County B was more likely to agree to these concepts while County A had more ‘I don’t know’ responses. County B also reported more positive responses to the item ‘My kids brush their teeth twice every day’ than did County A. However, for the reverse item of ‘Sometimes my kids don’t brush their teeth twice a day’, the trend did not hold for County B as there were more County B responses of ‘sometimes’ and ‘most of the time’ for this item. County A demonstrated more consistency between both items regarding childhood teeth brushing habits.

Another trend that was spotted in the resulting data was that both counties answered very similarly for the item ‘I have had cavities in my teeth’ with ‘sometimes’ being the most common answer. But for the item ‘My kids have had cavities in their teeth’ the results were statistically significantly different in that County B reported much higher responses of ‘rarely’ or ‘never’, while County A answered more with ‘sometimes’. With a slightly lower dentist to patient ratio, a much higher percentage of adults suffering from tooth loss, and the data by Dawkins et al. (2013) documenting that rural Kentucky Appalachian children have an average of two untreated dental caries it is suspected that this trend may be the result of not having seen a dentist to be properly diagnosed: parents may be unaware of the true status of their children’s dental health. This theory cannot be further investigated here as no data regarding dental professional visit history was obtained in this study.

Overall, the answers from County A were more consistent, particularly with the items that had matching reverse items, and with the items that had similar matching items with different wording. It was investigated to see if a lack of education played into the survey results, particularly in County B which has a lower rate of high school completion than that of County A. However, 11 people from County A reported a high school degree or less, while only three from County B reported the same. Chapter 5 will continue the analysis, particularly in how this data relates to the Health Belief Model framework, how it fits into the currently available literature and documentation, the limitations of this study, and how it suggests the need for further investigation and research

## Chapter 5: Final Interpretation

### **Introduction**

Presented here is the final interpretation of the research study. The findings are applied to the currently available documentation that was presented in the literature review. Additionally, the limitations of this study are presented as well as recommendations for future focus and research. Finally, the implications that this study identified are discussed along with the potential impact the findings could have on the included communities, as well as ways public health professionals could use these findings to introduce positive social change.

### **Interpretation of the Findings**

The results of this study served to confirm and extend the knowledge that was previously documented and presented in the literature review contained in Chapter 2. A concept that was investigated during the course of this study was the use of proper oral hygiene methods in the included participant pool. Brushing twice per day and flossing once per day are considered to be the most important and effective tools in the prevention of dental decay and disease (Kidd, 2011). These prevention measures are essential to begin when the first primary teeth appear in children, which can be as early as occurring at six months of age, as both the primary teeth and the later appearing permanent teeth erupt with immature enamel (Colgate-Palmolive, 2018; Kawashita, Kitamura, & Saito, 2011; Peterson-Sweeney & Stevens, 2010). This makes newly erupted teeth particularly susceptible to bacteria and cavities until the enamel is adequately mineralized. Although these oral hygiene methods are essential for proper oral health, there is little to no



information that details how often these methods are used, particularly in at-risk populations, such as the Kentucky Appalachian population. Frisbee et al. (2010) and Neiswanger et al. (2015) both evaluated for the use rates of oral hygiene methods in their studies and documented the need to determine if deficiencies in usage exist. If deficiencies are found, this provides public health officials an opportunity to advocate for more frequent usage in order to decrease the risk of dental decay and disease. In this study, it was evaluated for how often participants utilized oral hygiene methods. Of the adult participants, 73.8% of the responses indicated that oral hygiene methods are being utilized at frequencies of sometimes, rarely, or never. For the reported answers regarding children's oral hygiene habits, 82.0% of the responses indicated similar usage frequencies as adults. The frequencies in children were statistically significantly different than adults in that there were more answers of sometimes, rarely, and never. This data demonstrates that Kentucky Appalachian children may not be using oral hygiene methods at the same rates as their parents, let alone at recommended usage rates. The trend of poor usage rates as reported in this study assists to confirm the accepted belief that attitudes towards oral care are being passed down from parent to child and creating a cycle of poor dental health that is proving difficult to intercept (Blanton & Ricardson, 2011; Dye et al., 2011). This data also supports more recent statistics that show that the overall dental health status in some Kentucky Appalachian areas is actually worsening despite efforts such as school-based sealant and mobile dental programs (Blanton & Ricardson, 2011; Kentucky Youth Advocates, 2016). The extension in knowledge regarding oral hygiene methods that this study provided suggests that usage rates of brushing and flossing could be increased in

the Kentucky Appalachian population, both in adults and children, in an effort to decrease the occurrence of poor dental health.

Another concept that was investigated by this study, which was suggested by the available literature, was the level of perceived importance that Kentucky Appalachian adults hold towards oral hygiene. Savage et al. (2014) documented in their study, which took place at an Appalachian Kentucky college, that many participants reported that people in their communities did not place importance on proper oral health. This sentiment was echoed in a report by Kentucky Youth Advocates (2005) in which they documented that dental health is not considered a community priority and that this attitude is largely spread across Kentucky and not just isolated to the Appalachian areas. The study presented here found that the included participants were approximately split evenly between agreeing and disagreeing in believing that sometimes having poor teeth just happens and people can't change that. They were also almost evenly split between believing that cavities were a normal part of life. The data collected on these concepts support and expand on the previous findings of Savage et al. (2014) and the Kentucky Youth Advocates (2005) as participants in this study did not express strong positive trends in their beliefs of what constitutes a proper oral health status.

The major focus of this research study was the attempt to evaluate for the level of oral health literacy that was expressed by the included Kentucky Appalachian participants. The need for collecting this data was greatly supported by the currently available documentation, as well as the gaps that were identified in what was available. As presented in the literature review, it has been suggested that poor oral health literacy

may be acting as a barrier to proper dental health and that much like health literacy, oral health literacy levels may decrease in areas that have a poorer socioeconomic status, such as is found in Kentucky Appalachian areas (Centers for Disease Control and Prevention, 2011; Jones et al., 2007; Milfrom et al., 2004). Throughout the literature review, it was discovered that there is a limited amount of information that directly targets the concept of oral health literacy, however it is generally accepted that oral health literacy is dependent upon factors that are similar to what contributes to health literacy. It is documented that the Kentucky Appalachian population holds an overall lower level of health literacy, however, to date there is no readily available data regarding the overall oral health literacy level that exists in this area (Lee et al., 2012; Ludke et al., 2006). It is this gap in the current literature that greatly drove the development of this study.

It is accepted that a person's health literacy level is dependent upon the amount of knowledge a person holds towards health topics, which includes the ability to recognize a health risk (U.S. Department of Health and Human Services, 2018). Therefore, to evaluate for oral health literacy in this study, several concepts were taken into consideration in order to evaluate for the knowledge level towards oral health in the included participants. The first concept was if the included participants felt that dental decay was a health risk that could lead to further negative health events. A clear trend could not be determined from the provided responses: roughly the same number of people who agreed with dental decay as being an overall health risk that could lead to further health events also disagreed with this concept. This data suggested that there is a

deficiency in the ability to identify dental decay as a health risk that could pose additional health events in the included Kentucky Appalachian population.

A second concept that was considered when evaluating for oral health literacy level was if Appalachian adults felt that dental decay was a preventable health risk. Here, the responses were nearly split equally between agreement and 'I don't know'/disagreement. Again, the only trend that can be inferred from this data is that there isn't a clear understanding that dental decay can be preventable.

The third concept that was included when evaluating for oral health literacy was if Kentucky Appalachian adults felt that they could personally decrease the risk of dental decay or if they felt that their dental health status was dependent upon a dentist. Roughly 60% of the responses indicated the belief that their dental health status was dependent upon a dentist, with another 22% indicating that they didn't know. This inability to recognize their personal role in proper oral health served to further describe the amount of knowledge the included participant pool held towards oral health.

Although there were no similar studies to be found in order to compare results to, after considering these three concepts it was concluded that the overall expressed oral health literacy level of the included Kentucky Appalachian participants can be considered as low. This conclusion was reached due to the lack of trends showing a strong positive understanding of the included concepts. Additionally, the poor usage rates of oral hygiene techniques was considered in this conclusion as the ability to engage in self-care health related habits is accepted as being affected by a person's health literacy level (U.S. Department of Health and Human Services, 2018). Here, it is concluded that the poorer

understanding of the included concepts that was expressed by the included Kentucky Appalachian participants is contributing to the poor usage rates of oral health techniques that were reported. This study found that the oral health literacy level of the included parents did have a statistically significant correlation to how often their children brushed and flossed as indicated by  $p = .017$ . While there was no statistically significant correlation found in the adult participants, this study documented that they are generally not using oral hygiene methods in recommended frequencies. No statistically significant differences could be identified in the expressed oral health literacy level based on county designation. The expressed levels were generally similar in both the transitional and distressed Appalachian counties.

Another trend of note that was discovered in this study's data was that the included Kentucky Appalachian participants generally expressed awareness regarding the overall benefit of using oral hygiene methods both in themselves and their children. However, these expressed views were not evident in the very poor reported usage rates of oral hygiene methods. To assist in understanding this seemingly contradicting trend in the data, the health belief model (HBM) theoretical framework was utilized in data examination. To do this, the study presented here evaluated for the perceived self-efficacy towards using oral hygiene methods that was present in the included participant pool. The HBM's construct of self-efficacy refers to people's beliefs and confidence regarding their own capability to obtain proper levels of performance or results that may influence health events that could impact their lives (Bandura, 1994). As documented in the literature review, people are more likely to adopt positive health habits if they have a

higher level of self-efficacy regarding the health habit (Glanz et al., 2008; Schunk & Pajares, 2009). During the course of this study, it was found that roughly 62% of the included Appalachian adults felt that only by seeing a dentist frequently could they obtain proper dental health. Distressed County B respondents were more likely to feel this way than respondents from transitional County A and these results were significantly different from each other. This expressed correlation between dentists and proper oral health status suggested that a lower level of self-efficacy towards utilizing oral hygiene methods properly may exist. As an expansion on this suggestion, this study further investigated for how Kentucky Appalachian parents felt that enforcing childhood oral hygiene methods would correlate to children's risk of dental decay. Roughly 60% of the responses indicated agreement that enforcing childhood oral hygiene methods would benefit to decrease the risk of dental decay as their children age. However, this is not reflected in the reported usage rates of oral hygiene methods in children: the usage rates of oral hygiene methods of children were lower than the reported usage rates of adults. This data indicates that while many Kentucky Appalachian parents feel that oral hygiene methods may benefit their children positively, they hold poor self-efficacy in their own ability to enforce these habits in such a way that would properly improve their children's oral health. Additionally, to the survey item that stated 'I can still have poor teeth even if I brush and floss a lot', roughly 69.0% of the responses indicated agreement. This suggests that the included Appalachian adults also hold poor self-efficacy towards their ability to conduct oral hygiene methods well enough to obtain the correct results in themselves. As previously discussed, Glanz et al. (2008) and Schunk & Pajares (2009) maintain that

there is a direct correlation between a person's self-efficacy and their likelihood to adopt positive health habits. Based on this documentation and the data collected by the presented study, it is predicted that Appalachian adults are currently unlikely to adopt proper oral hygiene methods in themselves and their children due to a low level of perceived self-efficacy towards these methods.

On top of contributing to the poor usage rates of oral hygiene techniques, the discovery of a low level of self-efficacy also supports the findings of the included population having a subpar oral health literacy level. This is because a person's self-efficacy has been documented to correlate to their health literacy level as well as their health habits and self-care behaviors (Reisi et al, 2016; Xu & Leung, 2018). Those with a higher level of health literacy are shown to be more confident in performing positive health related habits and are more likely to practice these self-care behaviors (Bohanny et al., 2013; Campbell, Beardsley, Shaya, & Pradel, 2015; Reisi et al., 2016). As such, the overall low self-efficacy that was expressed by the participants included in the presented study serves to support the conclusion that Kentucky Appalachians hold a low level of oral health literacy. While this study was designed to evaluate self-efficacy towards oral hygiene techniques, it was not expected that the data would show such poor beliefs in these self-care behaviors. This is a significant finding with further implications that are discussed later in this chapter.

The study presented here also investigated for any statistically significant differences in the survey responses between the two included counties. It is documented that health literacy levels decrease in areas that are more socioeconomically distressed

(Horowitz & Kleinman, 2008; Milfrom et al., 2004). As County B holds an overall lower socioeconomic level it was expected that differences in the answers between the two counties would be due to County A having a higher socioeconomic status as well as a higher general level of formal education among its residents, as indicated by its designation of transitional. Thus, County A participants were expected to demonstrate an overall higher level of oral health literacy when compared to their counterparts from County B. While this study found few notable differences to this expectation that are discussed later as limitations, the overall trend found in the data here was the lack of differences in the responses between the two counties. This indicates that both counties largely share the same opinions and attitudes towards the concepts that were investigated for in this study. These findings demonstrate that County A and County B participants had similar levels of oral health literacy and understanding of the related concepts included in this study. At the beginning of this research study, there were four Kentucky Appalachian counties that had reached the economic status of transitional. At the time of this writing, there are now two counties in the Kentucky Appalachian regions that are considered transitional: the other two have now fallen into the at-risk designation (Appalachian Regional Commission, 2018b). No Kentucky Appalachian county is designated as holding the highest two ranks of competitive or attainment. These findings suggest that the level of oral health literacy may be largely the same across the entire Kentucky Appalachian region, regardless of county rank designation. This indicates that public health efforts geared towards proper oral hygiene are needed across the region and



should not just focus on the most distressed areas as the currently available literature suggests.

### **Limitations of the Study**

There are limitations to this study that were identified in the execution of this research project. The first of these limitations is that this study may have been at risk of social desirability bias. Social desirability bias is considered to be a respondent-related source of bias that can occur in research, particularly in studies that include the collection of self-reported participant responses to questions or statements (Grimm, 2010). It refers to the tendency of participants to respond in a way that they may feel is more socially acceptable as opposed to responding to how they actually feel towards a question or concept. Participants may answer differently if they feel they may be viewed negatively were they to express their true feelings or beliefs. The reason it is suspected that social desirability bias may exist in the presented study is that certain items contained in the survey were not answered in such a way that was consistent with documented trends that were reported by official agencies. As example, to the survey item ‘My kids have had cavities in their teeth’, the responses were statistically significantly different,  $p = .025$ , in that 68% of the responses from County B indicated an answer of rarely or never, compared to 38% from County A. However, it is documented that County B has over double the amount of adult tooth loss, which is defined as the loss of six or more teeth, than that of County A and that pockets of over three times the number of County A exist (Kentucky Health Facts, 2018). Although the survey item used in this study inquired about cavities and the state collected data reports tooth loss, the results of each do not

demonstrate a correlation to each other: an area experiencing such elevated levels of tooth loss in adults likely should have elevated rates of cavities and tooth decay in children. The data found here also does not support the results of the research by Dawkins et al. (2013) who found that an average of two untreated dental cavities existed in Kentucky Appalachian children, with the average increasing in the more rural Kentucky areas, of which County B is representative. It could be that respondents from County B felt the more socially acceptable response regarding their children and cavities was to report rarely or never. The discrepancies found in the collected data could also be a result of the Hawthorne effect, which describes how the knowledge of being in a research study may influence a participant into answering differently than they would outside of a research setting (McCambridge, Witton, & Elbourne, 2014). Knowing that they were participating in research may have influenced the included participants into answering how they thought they should answer as opposed to answering in a way that would more accurately portray their opinions or feelings. This may be particularly true of the participants from County B as they were largely more vocal in expressing that they had never been asked to participate in a research study before.

This trend could also be a result of self-report bias in that the status of 'have had cavities' or 'never had cavities' was determined by self-reported data. With a slightly lower dentist to population ratio than County A, the participants in County B may not regularly consult a dentist regarding their children's oral health status and it is possible that their children may have cavities and the parents not know it. To avoid this bias, dental health records could have been used to determine dental decay history for each

participant. However, this process would have eliminated any participants if they had not visited a dentist and thus had no documented dental records. Therefore the possibility for social desirability bias or self-report bias to exist in this study is acknowledged, particularly as another study that asked for the same information in a similar manner and population could not be located for result comparison.

Another limitation to this study was that the polling areas were limited to two counties. The results of this study would be more generalizable to the remaining Kentucky Appalachian population if more locations were included. Also of note, during the course of this study it was discovered that the responses were largely similar across both of the included transitional and distressed county. In light of this trend, it would have been beneficial to poll in a non-Kentucky Appalachian location in order to provide additional results to compare the Appalachian data to. This would have assisted in demonstrating if the Appalachian responses truly were different. For example, by comparing to a non-Appalachian location, it could have been more clearly determined if the seemingly low oral health literacy level that was expressed by the included Appalachian participants is actually low, or if it was similar to the rest of the state.

A final limitation to this study may be found in the instrument used for data collection. As previously demonstrated throughout this study, a pre-existing instrument designed to investigate for oral health literacy and the related concepts included in this study could not be readily found and so a survey was designed specifically for use here. Although much care was used when developing the survey items to attempt to ensure reliability among the survey items all while maintaining an easy to read format as the

Kentucky Appalachian region has a documented existence of low literacy levels, the survey may be at risk of lower reliability than an established instrument. Having no similar study to use as a comparison also introduced difficulties when deciding how best to analyze and present the Likert scale items. In the end, composite mean scores and the ratio of responses were largely used to display and report the trends found in the data. This study served to expand upon established concepts while discovering new trends in the targeted population. It is hoped that this study will be of value for anyone who desires to further research and expand upon the included concepts and findings in this population.

### **Recommendations**

After conducting the presented study, several recommendations have been identified that should be considered in future research and public health efforts to further extend upon the gathered knowledge and trends that were documented here. The first recommendation would be to further investigate why there was a trend of such poor self-efficacy regarding the use of oral health techniques. As previously reported, this study found that the included Kentucky Appalachian participants generally indicated awareness regarding the benefits of using oral hygiene techniques but at the same time indicated very poor usage rates of said techniques. One of the major findings of this research was that Kentucky Appalachians are largely not brushing or flossing in frequencies that are considered beneficial and that these habits are being passed on to children, indicating a cycle of poor oral health. An investigation into the reasons behind the poor self-efficacy Kentucky Appalachian adults are holding towards brushing and flossing would be

beneficial as this is effectively acting as an additional barrier between Kentucky Appalachians and a more positive oral health status.

In the Behavioral Health Continuum of Care Model, both prevention methods and treatment methods are listed as key elements to a person's overall wellbeing and health (Wyoming Department of Health, 2018). Prevention would include any intervention that is delivered prior to the onset of a health event in an effort to prevent or decrease the risk of a health event occurring. These prevention efforts are largely seen as the domain of public health officials. Treatment is any intervention that is delivered after the onset of a health event, and falls into the domain of medical doctors and personnel. The results of this study showed that people in Kentucky County B were more likely to respond that only by seeing a dentist could they obtain a good oral health status. However, what is not clear is how they are viewing dental professional care; do they see it as preventative, such as they can only have good teeth if they see a dentist regularly, or do they see it as they can only have good teeth if treatment by a dentist is obtained after tooth decay has occurred and when the tooth needs filling/removing. Knowing that Kentucky County B has such an elevated rate of adult tooth loss, it is suspected that residents in this county are more apt to view dentists similarly to medical doctors in that they view dentists as after the health event has occurred treatment providers. It would be beneficial to obtain more information into how Kentucky Appalachian's view dental professionals as if it was found that dentists are considered more as treatment providers it may help these communities if effort was made to bring the realization that dentists can also provide prevention methods to be used before dental decay occurs. This recommendation is

expanded to include an investigation into how dentists in the Kentucky Appalachian region are marketing themselves. If it were found that dentists are largely providing treatment after dental decay has set in, it may be beneficial to work with local dentists in order to help present to their communities that dental care can be preventative in nature instead of a treatment after the fact. While some areas of the Kentucky Appalachian region may be lacking in dental professional coverage, in areas where they are present they should be assisted and educated in how they may best introduce and build awareness towards proper oral health and hygiene habits in their local communities.

An additional recommendation for future efforts is grounded in the limitation portion of this chapter and that is to include more areas and polling locations. Including more Kentucky Appalachian areas would provide more generalizability of the results to the remaining Appalachian population. Polling from non-Kentucky Appalachian areas would possibly provide better comparison data to identify stronger trends and issues as it was found in this study that the results from a transitional and distressed county were oftentimes largely similar to each other. Including more areas would greatly assist in further grounding the suggestion that oral health literacy levels are similar across the Kentucky Appalachian region that was established by this study.

Another recommendation to be employed in future research efforts would be to physically inspect the oral health status of the included participants. While this recommendation would require much more extensive efforts from qualifying professionals, this information would be more accurate in establishing the true oral health status of the included participants. If this method couldn't be utilized, possibly due to

cost, time, or other limited resources, it would be beneficial to obtain past dental health records of included participants. These could be used to establish the existence of past or current dental disease. Either of these methods would assist in decreasing or eliminating the risk of social desirability or self-reporting bias that may be present in this study as the data would be collected from methods other than participant self-response. If these methods had been utilized in this study, it may have been found that the participants from County B actually do have an oral health status, including cavities past or present, in rates that are reported by official agencies instead of the self-reported rates of a much better oral health status that were collected here.

Further investigation as to what the perceived barrier(s) is(are) that is keeping Kentucky Appalachians from utilizing oral hygiene techniques at recommended rates would provide public health officials valuable information as to how to combat this issue. Examples of possible perceived barriers could be lack of time to perform oral health techniques, lack of tools such as toothbrushes, a lack of knowledge of how to perform oral health techniques properly, or any combination of these and more. Research that would narrow down on what perceived barriers exist would help public health officials to better tailor educational efforts in this population.

A final recommendation that has come about as a result of this study has to do with the methods of future research and investigation efforts should utilize. The study presented here did not collect any qualitative type data: all survey items were designed with close-ended response choices. However, there was a noteworthy observation regarding the participant pool that was made during the data collection process. This

observation was in the general behavior differences between the participants of County A and of County B. The participants in County A largely completed their surveys and returned them mostly in silence: there was little to no additional conversation past the invitation to take the survey and a brief instructional dialogue made by the researcher. This behavior was found to be in stark contrast to the behavior of their counterparts in County B. While the exact proportion was not tracked, it was the experience of the researcher that almost every participant in County B desired for and struck up additional conversation, which largely centered on stories of the participant/participant's friend or family member and their personal experiences with oral health issues. While neither group expressed much interest into why they were being asked to take a survey, County B participants as a whole expressed more positive feelings regarding being asked to be included. It was quite evident to the researcher that the participants in County B were eager to share their opinions, both by filling out the survey but especially by additional conversation. In light of this trend, it is recommended that future investigators consider using a face-to-face, qualitative method when gathering data in more rural areas of the Kentucky Appalachian region. Based on the how participants in County B were so quick to engage in conversation and volunteer information, it is believed that valuable, accurate insight into concepts of interest may be obtained by simply asking. This method may not be as successful in less rural areas of the Kentucky Appalachian region as participants from County A were more content to fill out their survey and generally did not attempt to engage in extra conversation or volunteer any additional information or opinions. Additionally, this qualitative approach may be of use by public health officials when



designing educational outreach programs into more rural Kentucky Appalachian areas. These efforts may be met with better results if they are delivered in a more personal, face-to-face format that encourages verbal engagement with community members as opposed to providing information by way of a leaflet, poster, or some other more impersonal method. Regardless of the method used, it is strongly recommended that more research is done to further investigate oral health literacy and how it is effecting the Kentucky Appalachian population.

### **Implications**

The results of this study demonstrated that the included Kentucky Appalachian participants are utilizing oral hygiene methods at usage rates that are far below the recommended frequencies. This trend was found to be present in both of the Kentucky Appalachian counties that were included in this study and were not significantly different based on their county rank designations of transitional and distressed. This information suggests that attempts to increase the usage rates of oral hygiene methods could greatly assist in decreasing the high rates of dental decay and disease that is occurring in the included Kentucky Appalachian locations, as well as possibly being beneficial to the remaining Kentucky Appalachian population. However, this study also demonstrated that programs that simply inform people in the included Kentucky Appalachian locations that they should brush twice a day and floss once per day likely will be met with lackluster results. As this study documented, the included participants demonstrated that they did indeed know that oral hygiene techniques should be used at recommended rates. The reason for this glaring contradiction in data is unknown, as discussed it could be

attributed to social desirability bias, self-report bias, or it could simply be that the participants had gleaned this information from some other source, such as a toothpaste commercial or a poster they have seen in a doctor's office. This study documented that when it came to utilizing oral health techniques at recommended rates, it was found that the included Kentucky Appalachian participants demonstrated poor self-efficacy towards these prevention methods.

Combining this trend with the collected data that showed that the included participants demonstrated a low understanding of concepts that are considered part of a person's oral health literacy level, it is concluded that there is an opportunity for public health officials and professionals to assist in breaking the poor oral health cycle that is affecting the included Kentucky Appalachian communities. The HBM dictates that people are more likely to adopt positive health habits if they understand the connection between the health habits and the health event and that they believe by utilizing the health habits they will decrease their personal risk of the health event occurring. Applying the HBM to this study, it is predicted that the included Kentucky Appalachian participants are currently unlikely to adopt appropriate oral hygiene techniques until public health officials and professionals:

1. Develop community based education programs that serve to bring awareness to the fact that dental decay is a largely preventable health risk.
2. Along with this awareness, the programs also need to present the correlation between oral hygiene techniques and dental decay: clean teeth are healthier, longer lasting teeth.

3. Introduce and promote personal empowerment in the oral health status of Kentucky Appalachian adults and their children. Stressing the control people have over their own oral health status could assist in improving the poor self-efficacy that was reported in this study.

The results of this study demonstrate that these are the main points that need to be addressed and considered when developing public health dental education efforts in Kentucky Appalachian communities. These efforts are needed to improve the poor usage rates of oral hygiene habits that were reported in this study. While there are many factors such as a lack of available dentists or poor diet that may contribute to poor oral health, using oral hygiene methods is arguably the best defense a person has against this health risk. As this study documented, the included Kentucky Appalachian participants reported a very poor usage rate in oral hygiene techniques and so it stands to reason that a usage rate increase in this population would lead to a decrease in the risk of poor oral health. To decrease the risk of poor oral health in this population would introduce a very positive social change. Individuals would benefit from this social change by possibly not experiencing the pain, discomfort, and malnutrition that is associated with severe dental decay and tooth loss. On a societal level, the cycle of poor oral health that has plagued the Kentucky Appalachian population for generations may finally be cracked, if not broken. While this change would not happen quickly, the wheel that is community education to improve the self-efficacy and oral hygiene method usage rates in the Kentucky Appalachian population needs to be set in motion. To allow it to remain stagnant means more generations of Kentucky Appalachian people will suffer from

dental decay, disease, and tooth loss, as this study documented that poor oral hygiene habits, and possibly the corresponding poor oral health literacy level, are being passed on in the current generation of Kentucky Appalachian parents and children.

To develop and introduce new community programs would be no small feat: they require manpower and resources that may not be readily available in abundance, if at all. To that end, facilities that are already established in the Kentucky Appalachian locations that were included in this study could possibly be utilized. Both of the Kentucky Appalachian counties that were included in this study had a local health department, neither of which currently have any sort of dental health awareness/educational program in place. Although the Kentucky Appalachian County B had a slightly less dentist to population ratio than County A, this decrease was not significantly different, meaning that both counties have nearly the same dental professional coverage. Public health professionals should work with the dentists that are presently practicing in these counties to enlist their efforts to better present dental decay as a preventative disease, as well as the correlation with proper oral hygiene techniques, to the surrounding communities. This effort could introduce positive organizational social change to the included communities as currently practicing dental health professionals may not have the knowledge or tools needed to provide effective dental decay prevention education to their patients. Although it was not a focus of this research, it is also worth noting that during the course of this study it was discovered that neither of the Kentucky Appalachian counties that were included have school-based, free, or income-based sealant programs in place. While sealants are not a long-term solution to the dental decay epidemic that is occurring in

Kentucky Appalachian areas, the addition of programs such as these could provide local dentists and public health professionals an additional opportunity to implement education to their respective communities. It is efforts like these described that are needed in order to decrease the rates of dental decay in the included Kentucky Appalachian areas and thereby bring about positive social change, both on the individual and societal levels.

### **Conclusion**

There are many documented and accepted reasons why the Kentucky Appalachian population continues to suffer from elevated rates of dental decay and disease. These reasons include poor insurance coverage, a lack of practicing dental professionals, and the lower education and socioeconomic levels that are generally found in Kentucky's Appalachian region. These issues are difficult to overcome without extreme intervention from the state and federal levels. This study sought, and found, additional factors that are contributing to the poor dental health status of Kentucky Appalachian areas:

1. Brushing and flossing are the best methods of self-defense against dental decay and the Kentucky Appalachian participants that were included in this study are not utilizing these methods in sufficient rates.
2. This study also demonstrated that the included participants overall had a poor level of oral health literacy and poor self-efficacy in the use of oral hygiene methods.

Until the oral health literacy level is improved in Kentucky Appalachian communities, the very high rates of dental decay and disease that are found in these areas are likely not going to decrease. A starting point would be to promote proper oral hygiene techniques,

as well as focus on improving the demonstrated poor efficacy people in these areas hold towards these methods. The promotion of dental decay as being largely self-preventable instead of having to be treated after it has occurred may also benefit Kentucky Appalachian communities. These are factors that public health professionals who are located in Kentucky Appalachian areas can realistically target and seek to improve upon in order to effectively begin to assist in decreasing the rate of dental decay and disease that has for so long plagued their local communities.

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## Appendix

## Individual survey items used in this study.

I know that I am volunteering in a research study.

If parents have poor teeth, their kids will too.

I floss my teeth every day.

Having cavities is a normal part of life.

Sometimes I am just too busy to brush my teeth twice a day.

Having poor teeth can lead to other health problems.

My kids floss their teeth every day.

If I brush and floss every day, I will have good teeth.

My kids have had cavities in their teeth.

Sometimes my kids don't brush their teeth twice a day.

People are born with either good teeth or bad teeth and they stay that way for their whole life.

I have had cavities in my teeth.

I brush my teeth twice every day.

Sometimes I am just too busy to floss my teeth every day.

Sometimes having poor teeth just happens and people can't help that.

I can only have good teeth if I see a dentist a lot.

If kids brush their teeth every day while they are young, they will have better teeth as they age.

If kids floss their teeth every day while they are young, they will have better teeth as they age.

As an adult I can still have poor teeth even if I brush and floss a lot, so why bother.

Kids can only have good teeth if they see a dentist a lot.

Sometimes my kids don't floss their teeth every day.

My kids brush their teeth twice every day.

If someone has bad teeth, they can only get better by seeing a dentist.

Having poor teeth can make me sick in other ways.

My yearly household income can be described as:

Below \$31,300    Above \$31,300

My education level can be described as:

Less than a high school degree    High school degree or more