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ASSESSING THE RELATIONSHIP BETWEEN ORAL HEALTH AND HIV STATUS,  
GENDER IDENTITY, AND SEXUAL ORIENTATION IN A SOUTHCENTRAL  
PENNSYLVANIA CLINIC

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## ABSTRACT

**Background:** Oral health has been historically excluded from traditional medicine. However, a vast body of research has linked oral and systemic health and concluded that good oral health is imperative to good overall health. While it is known that persons living with HIV/AIDS (PLWHA) and members of the lesbian, gay, bisexual, transgender, and questioning (LGBTQ+) community are two marginalized groups who face unique health challenges in other arenas, little to no research has been done to assess the oral health characteristics of the LGBTQ+ community globally and PLWHA community in southcentral Pennsylvania. This study seeks to explore the relationship between oral health and HIV status, gender identity, and sexual orientation to determine if these factors may be associated with various oral health characteristics.

**Methods:** This descriptive quantitative study used a survey design to gather self-reported demographic and oral health data using a 23-item survey. Participants were sampled from a southcentral Pennsylvania clinic primarily serving PLWHA and LGBTQ+ patients and invited to complete the paper survey during their clinic visit. A total of 229 surveys were collected.

**Results:** HIV positive individuals reported significantly poorer oral health status and higher rates of unmet oral health need while also reporting better oral health hygiene behaviors. No significant associations were found between gender identity and any oral health characteristics. Oral health outcomes varied by sexual identity; individuals who identified as a less common sexual orientation grouped into “Other” and those who identified as bi/pansexual reported consistently worse oral health states, behaviors, and attitudes compared to straight and gay/lesbian individuals.

**Conclusions:** The data suggest that PLWHA and LGBTQ+ persons have unique oral health characteristics and experience high rates of unmet oral health need. Oral health care should be encouraged in marginalized populations such as these to reduce such disparities.

## TABLE OF CONTENTS

LIST OF TABLES .....	iv
ACKNOWLEDGEMENTS .....	v
Chapter 1 INTRODUCTION.....	1
The Dental-Medical Divide .....	1
Oral Health and the Oral Systemic Connection.....	2
Oral Health in the United States .....	3
Social Determinants and their Impact on Oral Health.....	5
Persons Living with HIV/AIDS (PLWHA).....	7
Lesbian, Gay, Bisexual, Transgender, and Questioning (LGBTQ+) Persons .....	9
Demographics of Southcentral Pennsylvania .....	10
The Current Study.....	11
Chapter 2 METHODS.....	14
Study Design.....	14
Participants .....	14
Survey Instrument.....	15
Data Collection .....	16
Data Analysis.....	17
Arrangements for the Study.....	18
Chapter 3 RESULTS.....	19
Demographics .....	19
Oral Health Survey Results .....	19
Oral Health and HIV Status .....	21
Oral Health and Gender Identity.....	22
Oral Health and Sexual Orientation.....	22
Unmet Oral Health Needs and Demographic Associations.....	23
Chapter 4 DISCUSSION .....	25
Major Findings.....	25
Limitations.....	29
Conclusions.....	31
Tables .....	33
Appendix A ORAL HEALTH SURVEY .....	40
BIBLIOGRAPHY.....	45

**LIST OF TABLES**

Table 1. Demographic Information (total sample, n=229) .....	33
Table 2: Oral Health Survey Results (total sample, n=229) .....	34
Table 3: Oral Health Characteristics vs. HIV Status .....	35
Table 4: Oral Health Characteristics vs. Gender Identity .....	36
Table 5: Oral Health Characteristics vs. Sexual Orientation .....	38
Table 6: Unmet Oral Health Need by Demographic Categories .....	39

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## Chapter 1

### INTRODUCTION

#### **The Dental-Medical Divide**

The World Health Organization (WHO) defines health as the “state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity (World Health Organization, 2020).” Oral health however has been historically segregated from the rest of medicine and is often left out of this notion of overall health. This separation can be traced back to dentistry’s origin as a mechanical trade where taking care of teeth, typically in the form of tooth extractions, was a service performed by barbers (Otto, 2017). When these dental tradesmen identified a need to professionalize the service, they petitioned to have dentistry added to medical curricula. However, dentistry was denied inclusion by America’s medical schools who still viewed the service as a trade unrelated to health. This rejection prompted the tradesmen to open the world’s first dental college in 1840 (Otto, 2017). Since then, dentistry has remained its own profession and the medical profession has continued forward largely without oral health as a part of routine care.

Today, tensions between the US dental and medical systems are plentiful and the sides have been quick to point fingers at one another on issues that blur the line between the dental and medical professions. In multiple Institute of Medicine reports, the organization has chastised the US dental care delivery system for what they call the dental system’s failure in addressing the two most common oral conditions, periodontal (gum) disease and caries (tooth decay) (Mertz,

2016). The dental profession has lobbied strongly against medical system endorsed legislature that would allow school nurses and dental hygienists in schools to apply fluoride varnish to children's teeth without the supervision of a dentist (Otto, 2017). Caught in the middle are the American people whose overall health is now fragmented between two very distinct delivery systems.

### **Oral Health and the Oral Systemic Connection**

It was not until the release of the US Surgeon General's "Oral Health in America" report in 2000 that the intricate connection between oral and systemic health gained national attention. The report highlighted an overwhelming amount of research, both old and new, that ties oral health and systemic health together, concluding that good oral health is imperative to good overall health (U.S. Department of Health and Human Services, 2000). Unfortunately, oral health conditions, including periodontal disease and caries, are the most common chronic diseases in the world (World Health Organization, 2018). Even in the US, where oral health conditions are largely preventable, dental caries remains the top chronic disease among both children and adults (U.S. Department of Health and Human Services, 2000).

The relationship between oral and systemic health is highly intertwined. A long list of conditions including diabetes, leukemia, Crohn disease, bulimia/anorexia, and anemia are just a few of the many systemic diseases with oral manifestations ranging from oral lesions and periodontal bleeding to dental decay (Chi, Neville, Krayer, & Gonsalves, 2010). Even more noteworthy are the systemic manifestations of oral disease. Periodontal disease, colloquially known as gum disease, has been shown to negatively impact cardiovascular disease, Type 2



Diabetes, and pregnancy outcomes through the mechanism of chronic oral infection and inflammation (Kim & Amar, 2006). In addition to causing mild to severe pain, poor oral health has also been shown to negatively impact quality of life by limiting speech and communication skills, chewing ability, social relationships, and self-esteem (Bennadi & Reddy, 2013). All of these factors can limit the ability of an individual to achieve a “state of complete physical, mental and social wellbeing (World Health Organization, 2020).”

## **Oral Health in the United States**

### *Access to Oral Health Services*

As of 2017, approximately 23% of the US population lacked dental insurance (National Association of Dental Plans, 2019). This is more than 2.5 times the number of Americans who lacked health insurance (9%) in the same year (Berchick, Hood, & Barnett, 2018). While access to health insurance has received significant national attention in the past decade, dental insurance has been largely left out of insurance improvements. The passage of the Affordable Care Act in 2010 increased health insurance rates by mandating that all Americans purchase health insurance or face a penalty, however dental insurance remained optional and not one of the “essential health services” required by law (American Dental Association, 2013). These policies have increased the percentage of the American population who are generally viewed as “insured” but continue to lack access to dental care services, creating a hidden issue in the pursuit of healthcare for all.

While national oral health organizations recommend that individuals visit a dentist “regularly” for optimal oral health, data from the Centers for Disease Control and Prevention’s

(CDC's) National Center for Health Statistics found that only 64.0% of Americans reported seeing a dentist in the past year during the 2017 survey (National Center for Health Statistics, 2019). This may be due in part to lacks in dental insurance coverage and in some areas may be caused by shortages in dentists and dental offices, deemed "Dental Care Health Professional Shortage Areas (HPSAs)" by the federal government. These dental care HPSAs are defined as areas having less than one dental provider per 5,000 people (Kaiser Family Foundation, 2019). In the US, there 6,782 dental care HPSAs affecting over 56 million Americans (Kaiser Family Foundation, 2019). A total of 10,000 additional dentists would be needed to eliminate this gap across the US (Kaiser Family Foundation, 2019).

### ***Recommended Oral Health Behaviors***

In the US, it is recommended by organizations like the American Dental Association (ADA) and CDC that the practice of toothbrushing begins at the emergence of a child's first tooth and continues twice daily for the rest of an individual's life (Thornton-Evans et al, 2019). It is also recommended that individuals floss once daily, but these same organizations offer little guidance as to when during the lifespan flossing should commence (MouthHealthy, 2020). The use of fluoride, a naturally occurring mineral, has been proven to drastically reduce tooth decay in children by up to 70% and tooth loss in adults by up to 60% when supplemented in the community water supply and is considered one of the top ten greatest public health achievements of the 20<sup>th</sup> century (Centers for Disease Control and Prevention, 1999). Organizations like the ADA also recommend using toothpaste that contains fluoride to brush one's teeth, which is found in many toothpastes available commercially today (MouthHealthy, 2020).

### ***State of Oral Health in the US***

A large majority of the national data available on the state of oral health in the US is focused primarily on children and adolescents. This may be because interventions targeting the establishment of good oral hygiene in youth can be most effective at predicting good oral health later in life (MouthHealthy, 2020). Data available from the CDC's National Center for Health Statistics found that depending on age, an estimated 22.7% to 31.6% of US adults had untreated dental caries from 2013-2016 (National Center for Health Statistics, 2017). Data regarding periodontal rates were available for US adults age 30 years or older and found that an estimated 42% of US adults in this age range may have periodontitis (Eke et al, 2018).

### ***Oral Health in Pennsylvania***

In the state of Pennsylvania, there are 165 distinct dental care HPSAs. Almost two million Pennsylvanians live in these mostly rural and inner-city areas where it is difficult if not impossible to access dental care. This gap in access contributes to an over utilization of emergency room (ER) services, both for routine oral health concerns as well as for oral conditions that have been left to progress to serious problems. One study focused on quantifying the causes of ER visits in rural northwestern Pennsylvania found that over a ten year period (2004-2014), 3.3% of all ER admissions were related to dental and other oral health concerns (Zaborowski & Dawson, 2016). An estimated 80% of these admissions can be prevented with appropriate access to dental care and services (Wall, Nasseh, & Vujcic, 2014).

## **Social Determinants and their Impact on Oral Health**

### ***Economic Stability***

Oral health conditions disproportionately affect those with low economic status (World Health Organization, 2018). Low household income has been shown to be associated with oral cancer, dental caries, tooth loss, periodontal disease, and poor oral health quality of life (Singh, Peres, & Watt, 2019). Low income has also been associated with poorer oral health-related behaviors. One study using National Health and Nutrition Examination Survey (NHANES) data found that individuals in the lowest income quartile were more than 2.5 times less likely to visit a dentist once a year compared to individuals in the highest income quartile (26.3% vs 70.7%) (Sabbah, Tsakos, Sheiham, & Watt, 2009). The same study found that these individuals were also 1.5 times more likely to smoke (38.2% vs 24.0%). Smoking can weaken an individual's immune system and puts them at increased risk for gum infections and associated complications (Centers for Disease Control and Prevention, 2018).

### ***Education***

Oral health literacy and general health literacy have both been found to be strong predictors of poor oral health behaviors and subsequent adverse outcomes, with one study finding that individuals with low oral health literacy having on average seven more decayed, missing, and filled teeth compared to their counterparts (Baskaradoss, 2018). Studies have also linked oral health literacy to highest level of educational achievement, with 88% of those with Bachelor's degrees or higher and 56% of high school graduates ranking intermediate or proficient in oral health literacy compared to just 24% of those with less than a high school education (Office of Disease Prevention and Health Promotion, 2008).

### ***Race and Ethnicity***

Race and ethnicity have also been linked to poor oral health outcomes across the lifespan. Among US adults ages 25-44, 58% of non-Hispanic white adults versus 45.6% of Hispanic

adults and 42.5% of non-Hispanic Black adults maintain complete tooth retention. The racial/ethnic gap widens even further with age. Far fewer Hispanic adults (19.4%) and non-Hispanic Black adults ages 45-64 (10.9%) maintain complete tooth retention compared with non-Hispanic white adults (34.5%) (Dye, Li, & Thornton-Evans, 2012).

### ***Behavioral***

Oral health behaviors are the primary predictor of oral health outcomes (Broadbent et al, 2016). To achieve optimal oral health, the ADA recommends toothbrushing twice daily with fluoridated toothpaste, flossing between the teeth daily, eating healthy diets that limit sugary drinks and snacks, and seeing a dentist regularly (Mouth Healthy, 2020). The ADA also recommends avoiding tobacco use of any kind as there is a strong body of research identifying tobacco use as one of the top risk factors for oral disease. Tobacco use of all kinds, including smoking and chewing tobacco, has been linked to significantly increased risk of oral cancers, lesions, periodontal disease, caries, and ulcers (Winn, 2001).

### **Persons Living with HIV/AIDS (PLWHA)**

#### ***Barriers to Health***

Approximately 1.1 million persons living in the US have human immunodeficiency virus (HIV), the virus that causes acquired immunodeficiency syndrome (AIDS) (HIV.gov, 2020). Since the emergence of HIV/AIDS in the US in 1981, these persons have historically faced significant discrimination largely due to fear and ignorance of the condition. One national survey conducted in 2009 found that 71% of US adults gave inaccurate responses to questions regarding HIV transmission and 42% said they would be uncomfortable having a roommate who was HIV

positive (Anderson, 2009). A wide range of studies looking at HIV discrimination among health care workers have found status-related discrimination to persist even within the health care sector, however this practice has been more difficult to document on a national scale (Anderson, 2009). Many organizations including the CDC, WHO, and Joint United Nations Programme on HIV/AIDS (UNAIDS) offer resources and guidance for individuals who have experienced HIV status discrimination in the health care sector.

Individuals with HIV are more likely to have mental health issues as well as drug and alcohol use disorders due to the increased risk of infection among these groups (HIV.gov, 2019). Individuals with HIV are also at increased risk for co-infection with hepatitis, tuberculosis, and other opportunistic infections (HIV.gov, 2019). Furthermore, HIV positive individuals are two to three times more likely to use tobacco products and are at increased risk of associated cancers and pneumonia compared to HIV negative tobacco users (HIV.gov, 2019).

### ***Oral Health***

HIV positive individuals are especially at risk for related oral health complications (National Institute of Dental and Craniofacial Research, 2018). This is largely due to a weakened immune system, making infection risks more common and severe, as well as the side effects of certain medications used to treat the disease. The combination of these factors can result in dry mouth, ulcers, periodontal infection and bleeding, oral bone loss, and an assortment of other issues (National Institute of Dental and Craniofacial Research, 2018). An estimated 40%-50% of PLWHA experience related oral health complications, the majority of which can be either prevented or treated with proper oral hygiene and dental care (Petersen, 2006).

While access to regular dental care is crucial for PLWHA, approximately 50% of these individuals report unmet oral health needs (Jeanty et al, 2008). These PLWHA cite cost (54.8%),

access (17.6%), and fear (9.2%) as the top reasons for unmet needs. While access to dental care is an overarching challenge for many Americans, PLWHA face unique challenges that further complicate accessing care. Denying an individual equitable dental care based on HIV status was ruled in violation of the Americans with Disabilities Act in 1995 by the US Supreme Court, however the practice has not been eliminated (US Supreme Court, 1996). One qualitative study found that up to 45% of HIV positive adults had experienced stigma in a dental setting due to their HIV positive status (Patel, Furin, Willenberg, Apollon Chirouze & Vernon, 2015). While little data from the dental professional perspective exists in the US, one Canadian study suggests that as many as one in six dentists would refuse to treat an HIV positive patient (McCarthy, Koval, MacDonald, 1999).

## **Lesbian, Gay, Bisexual, Transgender, and Questioning (LGBTQ+) Persons**

### ***Barriers to Health***

Much of the research related to health outcomes and the LGBTQ+ community tends to group together the LGBTQ+ community as a whole without taking into consideration unique differences within the LGBTQ+ community itself. The Institute of Medicine's 2011 "The Health of Lesbian, Gay, Bisexual, and Transgender People" brief states: "Although LGBT people share with the rest of society the full range of health risks, they also face a profound and poorly understood set of additional health risks due largely to social stigma" (Institute of Medicine, 2011). The LGBTQ+ community as a whole is known to be at greater risk for substance abuse disorders, sexually transmitted diseases, and mental health disorders along with cardiovascular disease and cancer (Hafeez, Zeshan, Tahir, Jahan, & Naveed, 2017). Nationally, about 20% of

LGBTQ+ adults smoke cigarettes compared to 15% of straight adults (Centers for Disease Control and Prevention, 2019). Members of the LGBTQ+ community are also at increased risk for lack of insurance, homelessness, and suicide (Healthy People 2020, 2020). Due to provider stigma, insensitivity, and lack of awareness, this group also reports receiving lower quality care (Hafeez, Zeshan, Tahir, Jahan, & Naveed, 2017).

### ***Oral Health***

Little data exists on the oral health experiences of LGBTQ+ individuals. One recent study, the first of its kind, examining the relationship between sexual identity and oral health outcomes found that while clinical measures of oral health did not vary based on sexual orientation, self-reported subjective measures of oral health were worse among LGBTQ+ individuals compared to straight persons (Schwartz, Sanders, Lee, & Divaris, 2018). More research is needed to assess whether these findings are able to be replicated and to better understand exactly which components of oral health may be affected by gender identity and sexual orientation.

### **Demographics of Southcentral Pennsylvania**

Southcentral Pennsylvania can be broadly defined to include eight of Pennsylvania's 67 counties including Dauphin, Perry, Cumberland, Lebanon, York, Lancaster, Adams, and Franklin counties (South Central Assembly, 2020). Alder Health Services is one of the only HIV/AIDS and LGBTQ+ specialty clinics in this region, and therefore draws patients from all of these counties. Harrisburg, Pennsylvania, where Alder Health Services is located, is the state capital and home to approximately 50,000 people (United States Census Bureau, 2019). The city



limits span just over 8 square miles. However, the city serves as a major hub for services and resources for the greater southcentral PA region (DataUSA, 2018). More than 50% of the population is Black or African American and over 21% of the population is Hispanic or Latino (United States Census Bureau, 2019). Educationally, 79% of the population ages 25 and older are high school graduates and 20% have Bachelor's degrees, compared to 93% and 37% respectively of the US population as a whole (National Center for Education Statistics, 2019). The median household income is \$37,356 compared to the statewide average of \$59,445 and close to 30% of the population lives in poverty. Out of all of the southcentral PA counties, Cumberland ranks best at #7 and Dauphin ranks worst at #50 out of Pennsylvania's 67 counties in overall health outcomes (County Health Rankings, 2019).

Dauphin and York counties saw some of the highest numbers of new HIV diagnoses across the state in 2017 (Pennsylvania Department of Health, 2019). As of 2018, approximately 3,500 PLWHA were documented across the eight-county southcentral PA region, accounting for slightly less than 10% of the 36,000 total cases in the state (Pennsylvania Department of Health, 2019). Over 1,000 of these cases were located in Dauphin County alone (Pennsylvania Department of Health, 2019). Approximately 416,000 Pennsylvanians, equivalent to about 4.1% of the population, identified as LGBTQ+ in the 2018 Gallup/Williams poll (Movement Advancement Project, 2020). There are no statistics available to date to quantify the population of LGBTQ+ in southcentral Pennsylvania specifically.

## **The Current Study**

### ***Purpose***

The purpose of this study is to examine the oral health characteristics including status, behaviors, access, attitudes, and needs of the Alder Health Services clinic patient population in southcentral Pennsylvania. While recognition of the importance of oral health as a component of overall health is rising on a national scale, few studies have been done to understand oral health within the LGBTQ+ community. Additionally, no studies have been done to understand oral health within the PLWHA population in southcentral Pennsylvania. This study will begin to fill in these gaps in the literature surrounding the oral health experiences of these two vulnerable populations at Alder Health Services to inform next steps in promoting the overall health of LGBTQ+ and PLWHA persons in southcentral Pennsylvania.

### ***Research Questions and Hypotheses***

The objective of this study is to address the following three research questions.

1. What are the oral health characteristics of the patient population at the Alder Health Services clinic?
2. Are oral health characteristics related to:
  - a. HIV status?
  - b. Gender identity?
  - c. Sexual orientation?
3. Is unmet oral health need in the Alder Health Services patient population related to age, race, ethnicity, education level, household income, and/or tobacco use?

Based on the aforementioned literature review, the following hypotheses were selected:

1. The Alder Health Services patient population will have a large proportion of individuals with poor oral health status, poor oral health behaviors, poor oral health access and report many unmet oral health needs while having largely positive oral health attitudes.

2. In regards to HIV status, gender identity, and sexual orientation:
  - a. HIV positive status will be associated with more negative oral health characteristics and higher amounts of unmet need
  - b. Transgender individuals will report more negative oral health characteristics compared to their cisgender counterparts
  - c. Sexual orientation will have no association with oral health characteristics
3. In regards to unmet oral health need in the Alder Health Services patient population, age, race, ethnicity, education level, household income and tobacco use will all be associated with unmet oral health needs. Household income and tobacco use will be most significantly associated.

## **Chapter 2**

### **METHODS**

#### **Study Design**

This study was a descriptive quantitative research study that utilized a survey research design. An anonymous oral health survey was conducted at Alder Health Services in downtown Harrisburg as part of the clinic's annual patient survey. Patients were invited to complete the paper survey during their clinic appointment. Survey questions were primarily quantitative and captured demographics as well as oral health measures. One qualitative question in the survey asked participants to describe any current, unmet oral health needs. The paper surveys were collected by Alder Health Services staff and picked up in batches by the researcher at the Penn State College of Medicine where they were compiled into an electronic database. A total of 229 surveys were collected for analysis.

#### **Participants**

Alder Health Services is a non-profit clinic that was founded in the late 1980s as a result of the merger between the Lancaster AIDS Project and the South Central AIDS Assistance Network (Alder Health Services, 2020). The purpose of the organization was to provide coordinated HIV/AIDS care to the region's PLWHA population and it was originally named the

AIDS Community Alliance. Increased funding allowed the clinic to expand its services to the LGBTQ+ community in 2010. Today, Alder Health Services provides case management, primary care, and behavioral health services primarily to the underserved LGBTQ+ and PLWHA populations of southcentral Pennsylvania. However, it also serves a smaller population of needy non-LGBTQ+ and non-PLWHA persons in the community in accordance with their nondiscrimination policy (Alder Health Services, 2020).

No oral health services are currently available at Alder Health Services. As of September 2018, the clinic care for 281 case management patients, 408 primary care patients, and 271 behavioral health patients. Some of these patients accessed more than one service. All 480 unduplicated patients who received any service at Alder Health Services between January 20 and February 14, 2020 were eligible for the survey. A total of 229 (47.7%) of these patients completed the survey.

### **Survey Instrument**

A 23-item oral health survey was developed collaboratively between Alder Health Services and the oral health researcher at the Penn State College of Medicine. Ten demographic questions captured (1) HIV status, (2) gender identity, (3) sexual orientation, (4) three-digit ZIP code, (5) age, (6) ethnicity, (7) race, (8) education level, (9) household income, and (10) tobacco use. Three of these demographic questions (1-3) were of primary, novel interest to the researcher. The remaining seven demographic questions (4-10) were of secondary interest due to their known relationships to oral health in the general public.

Thirteen oral health-specific questions assessed the oral health (1) status, (2) behaviors, (3) access, (4) attitudes, and (5) needs of the study population. These questions were adapted from the WHO's Oral Health Questionnaire for Adults, CDC's NHANES Oral Health Questionnaire, and the ADA's Health Policy Institute's Oral Health and Well-Being in the United States Data and Methods. The primary goal of the survey was to provide an overall understanding of oral health across the study population and identify areas for future research. A copy of the survey is available in the appendix.

### **Data Collection**

Data collection was led by the Director of Case Management and Support Services at Alder Health Services. All staff and providers were briefed on survey collection methods and participated in data collection. Participation in the survey was voluntary and interested patients were given the opportunity to complete the survey independently in the waiting room or with assistance from a staff member/provider in the appointment room. Researchers at Penn State College of Medicine were not involved in the data collection process.

Completed paper surveys were received by the researcher at Penn State College of Medicine. Surveys were then manually entered into an online database. Study data were managed using the Research Data Capture (REDCap) electronic data management system hosted at Penn State Health Milton S. Hershey Medical Center and Penn State College of Medicine (Harris, Taylor, Thielke, Payne, Gonzalez, & Conde, 2009).

## Data Analysis

Statistical analysis was conducted using both R (version 3.6.3) and SAS (version 9.4). Some survey responses were recoded to create new variables of interest or regrouped in the case of small sample sizes. All responses marked as “Don’t know” were coded as missing with the exception of the question regarding fluoride use. HIV positive status was coded as “yes” if survey respondents checked “Medical Case Management” as one of the services they received from Alder Health Services and “no” if they did not check “Medical Case Management.” Gender identity was recoded into two categories with “Male” and “Female” recoded to “Cisgender” and “Transgender male to female” and “Transgender female to male” recoded as “Transgender.” “Other” gender identities were removed from this analysis due to the small sample size (n=7). Age categories “12-18” and “19-24” were grouped into an “Under 25” age category. Races other than “White” and “Black/African American” and responses that checked more than one race were recoded as “Other/Mixed.” “Bisexual” and “Pansexual” sexual orientations were coded as one variable and “Asexual” was coded as “Other.” Any amount of tobacco use was classified as “Yes” and “Never” was classified as “No.”

Questions with ordinal, time-based responses (toothbrushing frequency, flossing frequency, and length since last dental appointment) were assigned numerical values and analyzed using means and T-tests. The remaining nominal response questions were analyzed using Chi-squared tests. For the analysis of sexual orientation versus oral health outcomes, the question “How would you describe the current state of your teeth and gums” was assigned numerical values and analyzed using means due to the smaller sample sizes within the

orientation categories. The results of the one qualitative question asking patients to describe their current unmet oral health needs were not included in this analysis.

### **Arrangements for the Study**

This study was reviewed by the Institutional Review Board (IRB) Human Subjects Protection Office (HSPO) at Penn State College of Medicine and Penn State Health. The study received the determination of Not Human Research (STUDY00013825). IRB approval material is available upon request.

Alder Health Services maintained complete control over survey design decisions and data collection. All survey data received by the researcher at the Penn State College of Medicine included no protected health information (PHI) as described by the Health Insurance Portability and Accountability Act (HIPAA).

This study was funded by a Penn State Health Community Relations Grant. Funding from this source supported survey development, paper survey printing, and data collection efforts on the part of Alder Health Services. The findings of this thesis do not necessarily represent the opinions of the Penn State Health Community Relations Department or Penn State Health at large. Findings have not yet been presented to Alder Health Services.



## **Chapter 3**

### **RESULTS**

#### **Demographics**

Demographic information is detailed in Table 1. Over one-fourth of the survey population identified as HIV positive (28.4%) and a quarter of the population identified as transgender (24.9%). A diverse pool of sexual orientations were identified and included straight (41.0%), gay/lesbian (33.2%), bi/pansexual (18.9%), and other (6.9%). A majority of survey participants were White (61.8%) followed by African American/Black (22.7%) and other/mixed race (15.6%). More than half of participants reported a household income of less than \$20,000 a year (52.3%) and almost three quarters reported a household income of less than \$40,000 a year (73.6%). Half of participants were tobacco users (45.9%).

#### **Oral Health Survey Results**

Overall oral health survey results are presented in Table 2.

##### ***Status***

Nearly half of the survey population reported experiencing teeth or mouth pain/discomfort in the past 12 months (40.2%). When asked to describe the current state of their

teeth and gums, 23% assessed their teeth/gums in poor or very poor condition, 38.9% in average condition, 22.9% in good condition, and 25.2% in very good or excellent condition.

### ***Behaviors***

Over half all of survey participants reported that they are meeting the ADA's recommendation of twice daily toothbrushing (53.8%) while a large majority report brushing their teeth at least once daily (88.5%). Alternatively, only one-quarter of survey participants reported meeting the ADA's recommendation of once daily flossing (25.4%) and close to a third of the survey population reported that they never floss (31.7%). A majority of the population reported using fluoridated toothpaste to brush their teeth (67.9%) while a notable 21.4% reported that they did not know if their toothpaste contained fluoride.

### ***Access***

Most survey participants reported having dental insurance (78.3%) while a smaller proportion reported having a single dentist or dental office that they used for their usual source of care (61.8%). The majority of participants reported a routine check-up/exam/cleaning as the reason for their last trip to the dentist (63.5%) followed by trips for treatment/follow-up treatment (18.5%) and pain/trouble with the teeth, gums or mouth (17.1%), with very few reporting their last visit was for consultation/advice (0.9%). Participants also indicated length of time since their last dental visit, with 38.6% having seen a dentist in the past 6 months, 19.5% in the past 6 months to year, 29.9% in the past year to 5 years, and 12.2% having seen a dentist more than 5 years ago or having never seen a dentist.

### ***Attitudes***

Survey participants almost unanimously responded that they valued keeping their mouth healthy with 78.5% of participants strongly agreeing and 19.3% of participants agreeing with the

statement, “I value keeping my mouth healthy.” Only 2.2% of participants indicated that they did not value keeping their mouth healthy.

### ***Needs***

A third of participants indicated that there had been a time in the past 12 months when they needed dental care but were unable to get it (32.2%). An even higher proportion of individuals reported that they currently had oral health needs that were unmet (36.7%).

### **Oral Health and HIV Status**

HIV status and oral health question comparisons are detailed in Table 3. HIV status was found to be significantly associated with self-reported toothbrushing frequency, current tooth and gum state, and unmet oral health needs. HIV positive (+) individuals were five times more likely than their HIV negative (-) counterparts to report the current state of their teeth and gums as “very poor” (16.4% v 3.2%) and 1.5 times less likely as “excellent” or “very good” (19.7% vs 27.3,  $p=.014$ ). HIV+ individuals were also 37% more likely to report having unmet oral health needs than those who were HIV- (49.2% vs 31.2%,  $p=.021$ ). However, HIV+ individuals reported slightly more frequent toothbrushing compared to their HIV- counterparts ( $p=.021$ )

Although not statistically significant, HIV+ persons appeared less likely to have visited a dentist last for a routine check-up/exam/cleaning (53.3% vs 67.5%) and more likely to have gone for treatment/follow-up treatment (26.7% vs 15.2%,  $p=.135$ ). There were little to no differences found between HIV+ and HIV- individuals in length of time since last dental visit, percentage with dental insurance, and percentage with an established dentist and/or dental home.

## **Oral Health and Gender Identity**

Gender identity and oral health question comparisons are detailed in Table 4. No statistically significant associations were found between gender identity and any of the oral health questions. Although not statistically significant, transgender persons seemed to place less value on keeping their mouth healthy. While almost the entire population selected that they agreed or strongly agreed with the statement, “I value keeping my mouth healthy,” only 71.1% of transgender persons strongly agreed compared to 81.5% of cisgender persons ( $p=.070$ ). Additionally, transgender persons seemed to report slightly longer lengths of times since their last dental visit compared to cisgender individuals (2.5 vs 2.1,  $p=.099$ ). Transgender persons also seemed to report less frequent tooth brushing (6.2 vs 6.4,  $p=.180$ ). Again, although not statistically significant, transgender individuals appeared more likely to have dental insurance compared to their cisgender counterparts (86.5% vs 75.0%,  $p=.124$ ).

## **Oral Health and Sexual Orientation**

Sexual orientation and oral health question comparisons are detailed in Table 5. Sexual orientation was found to be significantly associated with tooth or mouth pain in the past 12 months ( $p=.048$ ). Individuals who identified as a sexual orientation classified as “other” were most likely to report oral pain in the past 12 months (61.5%) followed by individuals identifying as bi/pansexual (52.6%), straight (40.2%), and gay/lesbian (30.0%). Sexual orientation was also found to be significantly associated with self-reported tooth and gum states ( $p=.028$ ). Individuals identifying as a sexual orientation classified as “other” reported the worst states, followed by

straight individuals, bi/pansexual individuals, and gay/lesbian who reported the best states. A similar, significant association was found between sexual orientation and level of agreement with the statement, “I value keeping my mouth healthy,” ( $p=.018$ ). Individuals identifying as a sexual orientation classified as “other” reported the least amount of agreement followed by bi/pansexual individuals, straight individuals, and gay/lesbian individuals reporting the highest level of agreement.

Although not statistically significant, sexual orientation seemed to be associated with toothbrushing frequency ( $p=.103$ ). Individuals identifying as a sexual orientation classified as “other” seemed to engage in less frequent toothbrushing, followed by bi/pansexual individuals and then straight/gay lesbian individuals who both reported equal frequencies.

### **Unmet Oral Health Needs and Demographic Associations**

Demographic characteristics by unmet oral health need are detailed in Table 6. Tobacco use was found to be the only variable significantly associated with unmet oral health needs, with individuals with unmet oral health needs 29% more likely to be a tobacco user than those without unmet needs (56.2% vs 40%,  $p=.028$ ).

Although not statistically significant, individuals with unmet oral health needs were 28% more likely to have a household income of less than \$20,000/year and individuals without unmet oral health needs were 50% more likely to have a household income of more than \$40,001/year ( $p=.062$ ). Individuals with unmet oral health needs also appeared twice as likely to be between the ages of 55-64 and 30% less likely to be under 25 compared to those with no unmet oral

health needs ( $p=.151$ ). No associations were found between unmet oral health need and education, race, or Hispanic/Latino origin.

## Chapter 4

### DISCUSSION

#### Major Findings

The survey population had notable demographic differences compared to the larger population of southcentral PA. While the median household income averages \$40,000/year in the southcentral PA region and \$35,000/year in the downtown Harrisburg clinic region, over 50% of Alder Health Services' patient population reported household incomes less than \$20,000/year (DataUSA, 2018). This is notable since Alder Health Services is not a free clinic, however is still serving a sizable population of patients living below the poverty line. HIV status has previously been linked to lower household incomes in urban regions (Denning and DiNenno, 2019) and poverty rates have also been found to be higher among LGBTQ+ populations (American Psychological Association, 2019). These correlations may be partially contributing to the lower income rates. Additionally, Alder Health Services accepts the Medicaid insurance plan, which may attract a higher proportion of low income individuals (Alder Health Services, 2020). Another factor may be Alder Health Services' community presence and dedication to connecting patients with social support services, which may be appealing to lower income populations looking to select a health care location.

A second notable difference was in reported tobacco use. Nearly 50% of the survey population reported tobacco use, compared to the 15-19% average across southcentral PA counties (County Health Rankings, 2019). These findings are somewhat consistent with previously mentioned data that suggest tobacco use rates are 2-3 times higher among HIV+

persons and slightly heightened (15% vs 20%) among LGBTQ+ adults, however these numbers are still surprisingly high. Geographic variables may also play a role in the high tobacco use rates, as tobacco use across US adults has been shown to be highest in rural and urban regions as opposed to more suburban regions (Centers for Disease Control and Prevention, 2019).

Southcentral PA has a unique combination of urban and rural regions. Metropolitan Harrisburg, the state capital and location of Alder Health Services, is surrounded by large regions of rural farmland.

Interestingly, a large proportion of the survey population reported poor oral health states and high rates of unmet needs while simultaneously reporting good oral hygiene behaviors, seemingly few access barriers, and strong positive attitudes towards oral health. These findings were surprising, as poor oral hygiene behaviors and low access to dental care services are consistently cited as the most common and impactful barriers to good oral health outcomes. However, these barriers did not appear to be significant issues for this population. Although Alder Health Services does not offer dental referrals or dental services on site, it is possible that patients are indirectly linked to oral health insurance coverage and other oral health promoting resources through the other social services resources provided by the clinic. These include assistance applying to entitlement programs, referrals to community resources, and on-site support groups and community events. It is also possible that while survey participants appear to have access to dental services on paper and self-report good oral hygiene behaviors, the specific questions used in this survey do not capture the full picture of oral health care access and behavior. It may be the case that while individuals have dental insurance, out-of-pocket costs prevent them from receiving the full span of dental treatments they need and/or that participants over reported oral hygiene behaviors.



Another possibility is that although patients reported good oral health behaviors and few access barriers at the time of the survey, no questions were included to capture the oral health experiences of those individuals in childhood. As previously mentioned, it is well accepted that oral health interventions in youth can be the most effective at establishing healthy oral states in adulthood (MouthHealthy, 2020). Considering that a large majority of the survey population may be classified as low socioeconomic status based on their responses to the demographic questions, access to dental professionals may not have been available to individuals throughout their lifespan. It cannot be assumed that their oral hygiene behaviors were established in childhood. This may explain that while it appears that individuals are taking responsibility for their oral health and have access to dental care in the current moment, they are still dealing with oral health issues that may be a result of oral health neglect in childhood.

It is unsurprising that HIV+ persons reported poorer tooth and mouth states compared to their HIV- counterparts due to the previously described oral complications related to HIV+ individuals' weakened immune system and possible medication side effects (National Institute of Dental and Craniofacial Research, 2018). However, it is notable that while no difference was found in dental insurance rates, length of time since last dental visit, or percentage with an established dentist/dental home, HIV+ persons were still 37% more likely to report unmet oral health needs. These findings may suggest that HIV+ persons engage in less oral hygiene behaviors. However our survey found that HIV+ persons reported more frequent toothbrushing than the HIV- population. One possible explanation may be that although there was no difference in the mean length of time since last dental visit, the average for both groups fell between one and two years. While this length of time between visits may be sufficient to maintain the oral

health needs of HIV- persons, more frequent dental contact may be needed with HIV+ patients to address their needs due to the known oral complications of the condition.

Results related to gender identity found no significant relationships between gender identity and oral health outcomes. While the literature suggests that transgender persons experience more barriers to health care and subsequent health disparities (Safer et al, 2016), it does not appear from these findings that this phenomena extends into the dental sphere for this population. One theory could be that well-known barriers to general health care for individuals who are transgender do not translate to dental care. A review of the literature summarizing barriers to health care for transgender persons found that the primary barrier to health care reported by transgender individuals was lack of access to physicians knowledgeable on transgender care (Safer et al, 2016). While this barrier may be substantial for general health care, it may not play a role in the knowledgeable provision of dental care. Further research is needed to understand if and how known health inequities related to gender identity may be mitigated in the dental realm.

In regards to sexual orientation, individuals who identified as a sexual orientation grouped as “other” and individuals who identified as bi/pansexual tended to report poorer oral health characteristics, behaviors, and attitudes compared to straight and gay/lesbian populations. Not only were these groups more likely to report poorer oral health states, but they also reported less frequent toothbrushing and lower value in keeping their mouth healthy than their straight and gay/lesbian counterparts. These novel findings are notable not only for their oral health implications, but also for their larger implications in LGBTQ+ research. Research on this population tends to focus on the LGBTQ+ community as a whole, assuming that the experiences of all individuals with minority sexual orientations and gender identities have similar health

experiences. However this study suggests that this may not be the case. One explanation for this may be related to society's differing acceptance of individuals based on their specific sexual orientation. While little research comparing the experiences of specific sexual orientation subgroups exist, research that does suggests that bisexual individuals are more likely to experience binge drinking, self-harm, and suicidal thoughts, and are far less likely to share their sexual orientation with their close friends and family (GLAAD, 2016). These findings suggest that these individuals may be less accepted by society compared to their gay/lesbian counterparts. It also is possible that while improvements in the equitable provision of health care to lesbian/gay populations may be growing, these successes do not extend to other minority sexual orientations.

When looking at predictors of unmet oral health need, only tobacco use out of the six demographic variables of interest including age, race, ethnicity, education, and household income was found to be significant. The significance of tobacco use on oral health outcomes was not surprising given the known impact of tobacco on oral health outcomes. While factors including age, race, ethnicity, education, and household income have been associated with oral health in other populations, it does not appear that they have a significant impact on unmet oral health needs in this population. This may be a result of sample size restraints and/or a result of only looking at self-reported unmet oral health needs.

## **Limitations**

This descriptive study was designed to identify oral health differences in Alder Health Services' patient population and cannot be extrapolated to the larger community. Analyses of the

relationship between oral health and HIV status, gender identity, and sexual orientation were not controlled for each other or other potentially confounding demographic variables. These underlying confounding variables may account for some or all of the associations that were found in this study, meaning a direct relationship cannot be inferred.

Oral health characteristics of interest were broadly grouped into five areas of interest and included oral health status, behaviors, access, attitudes, and needs. However, no composite score existed to allow questions in each category to be grouped into one score representative of each area of interest. Therefore, analysis was conducted on a question by question basis and the study was not able to report on findings more broadly related to the five areas of interest.

This study relied on self-reported data from survey participants to gather perceived oral health characteristics that may or may not be truly representative of the clinical manifestations of their oral health characteristics. Response bias may have skewed the results towards more favorable oral health behaviors such as more frequent toothbrushing/flossing responses as patients completed the survey at their health care appointment and may have felt pressure to respond positively towards these known endorsed health behaviors. Additionally, patients who completed the survey independently may have responded differently than patients who completed the survey with a provider.

This study limited the analysis of gender identity to transgender versus cisgender and did not tease out differences between male, female, transgender male to female, and transgender female to male. Because of the small sample size, individuals identifying as a gender identity that did not fit into the cisgender or transgender categories were removed from this analysis. Addition of these groups may have revealed nuanced differences that were not apparent between the two larger groups.

## Conclusions

The findings from this study suggest that the oral health disparities known to exist nationally in the US among HIV+ persons are present to some extent among those in southcentral Pennsylvania. The findings also suggest that oral health disparities within the LGBTQ+ community exist and that there may be nuanced differences in the oral health characteristics of populations at the specific gender and sexual orientation level. An alarming proportion of both of these populations reported unmet oral health needs, highlighting the need for increased oral health services among these marginalized groups. While the impact of gender identity and sexual orientation on oral health experiences may be less intuitive than the impact of HIV status, the results of this study have found that sexual orientation may have just as big of an impact on oral health experiences as HIV status. This finding is key in advocating for a coordinated approach to oral health across clinics that serve a high proportion of these patients.

The findings of this study also suggest that oral health in this population cannot be improved simply with interventions aimed at increasing oral hygiene behaviors, access to dental care services, or awareness of the value of oral health. While these steps are appropriate in populations where these rates are low or on an individual case by case basis, the direct benefits they may have in these populations as a public health intervention are questionable and one cannot assume that they will necessarily improve oral health states or reduce unmet oral health need. Future studies should consider the childhood oral health experiences of adults in these populations to see if these factors may be more predictive of oral health outcomes in adulthood and perhaps be an area more suited for preventative interventions.

In regards to next steps for the oral health of the PLWHA and LGBTQ+ communities in southcentral PA, efforts should be made to address the oral health needs of those who may be most at risk, including those who express poor oral health behaviors and barriers to accessing dental care. A larger scale study across the population and explanatory qualitative research is needed to better understand these preliminary differences and to extend these findings outside of the Alder Health Service patient population. These findings however may be useful in seeking funding to support the needs of Alder Health Services' patient population on a case by case basis so that dental health services can be made more readily available to those with significant need.

## Tables

Table 1. Demographic Information (total sample, n=229)

Demographic Variable	Percent (%)
<b>HIV Positive</b>	
Yes	28.4 (65)
No	71.6 (164)
<b>Gender</b>	
Cisgender	75.1 (166)
Transgender	24.9 (55)
<b>Age</b>	
Under 25	16.7 (38)
25-34	27.8 (63)
35-44	17.6 (40)
45-54	17.2 (39)
55-64	14.5 (33)
65+	6.2 (14)
<b>Race</b>	
White	61.8 (139)
Black/African American	22.7 (51)
Other/Mixed	15.6 (35)
<b>Hispanic/Latino</b>	
Yes	11.5 (26)
No	88.5 (200)
<b>Sexual Orientation</b>	
Straight	41.0 (89)
Gay/Lesbian	33.2 (72)
Bisexual/Pansexual	18.9 (41)
Other	6.9 (15)
<b>Education</b>	
Less than high school	5.0 (11)
High school but no diploma	10.9 (24)
High school graduate/GED	26.7 (59)
Some college but no degree	23.5 (52)
Associates degree	9.9 (22)
Bachelor's degree or higher	24.0 (53)
<b>Household income</b>	
Under \$20,000	52.3 (113)
\$20,001 - \$40,000	21.3 (46)

\$40,001 - \$70,000	15.3 (33)
\$70,001 - \$100,000	6.5 (14)
\$100,001 or more	4.6 (10)
<b>Tobacco use</b>	
Yes	45.9 (101)
No	54.1 (119)

**Table 2: Oral Health Survey Results (total sample, n=229)**

	<b>Percent (%)</b>
<b>During the past 12 months, did your teeth or mouth cause any pain or discomfort?</b>	
Yes	40.2 (88)
No	59.8 (131)
<b>How would you describe the current state of your teeth and gums?</b>	
Excellent	7.8 (17)
Very Good	17.4 (38)
Good	22.9 (50)
Average	28.9 (63)
Poor	16.1 (35)
Very Poor	6.9 (15)
<b>How often do you brush your teeth?</b>	
Twice a day (7)	53.8 (121)
Once a day (6)	34.7 (78)
2-6 times a week (5)	8.4 (19)
Once a week (4)	1.3 (3)
2-3 times a month (3)	0.0 (0)
Once a month (2)	0.0 (0)
Never (1)	1.8 (4)
<b>How often do you floss?</b>	
Twice a day (7)	7.7 (17)
Once a day (6)	17.6 (39)
2-6 times a week (5)	21.4 (45)
Once a week (4)	7.2 (16)
2-3 times a month (3)	7.7 (17)
Once a month (2)	7.7 (17)
Never (1)	31.7 (70)
<b>Do you use a toothpaste that contains fluoride to brush your teeth?</b>	
Yes	67.9 (152)
No	10.7 (24)
Don't Know	21.4 (48)
<b>I value keeping my mouth healthy.</b>	



Strongly Agree	78.5 (175)
Somewhat Agree	19.3 (43)
Somewhat Disagree	1.8 (4)
Strongly Disagree	0.4 (1)
<b>How long is it since you last saw a dentist?</b>	
Less than 6 months (1)	38.6 (86)
6-12 months (2)	19.5 (43)
More than 1 year but less than 2 years (3)	13.6 (30)
2 years or more but less than 5 years (4)	16.3 (36)
5 years or more (5)	10.8 (23)
Never received dental care (6)	1.4 (3)
<b>What was the reason for your last visit to the dentist?</b>	
Routine check-up/exam/cleaning	63.5 (134)
Pain or trouble with teeth, gums, or mouth	17.1 (36)
Treatment/follow-up treatment	18.5 (39)
Consultation/advice	0.9 (2)
<b>Do you have a single dentist or dental office that is your usual source of dental care?</b>	
Yes	61.8 (134)
No	38.2 (83)
<b>Do you currently have dental insurance?</b>	
Yes	78.3 (166)
No	21.7 (46)
<b>During the past 12 months, was there a time when you needed dental care but could not get it at that time?</b>	
Yes	32.2 (68)
No	67.8 (143)
<b>Do you currently have any oral health needs that are unmet?</b>	
Yes	36.7 (76)
No	63.3 (131)

**Table 3: Oral Health Characteristics vs. HIV Status**

	All (n=229)	HIV+ (n=65)	HIV- (n=164)	p- value*
<b>During the past 12 months, did your teeth or mouth cause any pain or discomfort?</b>				
Yes	40.2 (88)	37.7 (23)	41.1 (65)	.756
No	59.8 (131)	62.3 (38)	58.9 (93)	
<b>How would you describe the current state of your teeth and gums?</b>				
Excellent	7.8 (17)	8.2 (5)	7.6 (12)	.014
Very Good	17.4 (38)	11.5 (7)	19.7 (31)	
Good	22.9 (50)	21.3 (13)	23.6 (37)	
Average	28.9 (63)	32.8 (20)	27.4 (43)	

Poor Very Poor	16.1 (35) 6.9 (15)	9.8 (6) 16.4 (10)	18.5 (29) 3.2 (5)	
<b>How often do you brush your teeth?</b>	6.3 (1.01)	6.5 (0.59)	6.3 (1.12)	.021
<b>How often do you floss?</b>	3.6 (2.17)	3.6 (2.32)	3.6 (2.11)	.947
<b>Do you use a toothpaste that contains fluoride to brush your teeth?</b>				
Yes	67.9 (152)	77.0 (47)	64.4 (105)	.127
No	10.7 (24)	4.9 (3)	12.9 (21)	
Don't Know	21.4 (48)	18.0 (11)	22.7 (37)	
<b>I value keeping my mouth healthy.</b>				
Strongly Agree	78.5 (175)	80.3 (49)	77.8 (126)	.798
Somewhat Agree	19.3 (43)	19.7 (12)	19.1 (31)	
Somewhat Disagree	1.8 (4)	0.0 (0)	2.5 (4)	
Strongly Disagree	0.4 (1)	0.0 (0)	0.6 (1)	
<b>How long is it since you last saw a dentist?</b>	2.4 (1.47)	2.5 (1.44)	2.4 (1.48)	.899
<b>What was the reason for your last visit to the dentist?</b>				
Routine check-up/exam/cleaning	63.1 (128)	53.3 (32)	67.5 (102)	.135
Pain or trouble with teeth, gums, or mouth	16.7 (34)	18.3 (11)	16.6 (25)	
Treatment/follow-up treatment	19.2 (39)	26.7 (16)	15.2 (23)	
Consultation/advice	1.0 (2)	1.7 (1)	0.7 (1)	
<b>Do you have a single dentist or dental office that is your usual source of dental care?</b>				
Yes	62.7 (131)	61.0 (36)	62.0 (98)	1.000
No	37.3 (78)	39.0 (23)	38.0 (60)	
<b>Do you currently have dental insurance?</b>				
Yes	78.5 (161)	77.0 (47)	78.8 (119)	.923
No	21.5 (44)	23.0 (14)	21.2 (32)	
<b>During the past 12 months, was there a time when you needed dental care but could not get it at that time?</b>				
Yes	31.5 (63)	37.5 (24)	29.9 (44)	.357
No	68.5 (137)	62.5 (40)	70.1 (103)	
<b>Do you currently have any oral health needs that are unmet?</b>				
Yes	36.7 (72)	49.2 (31)	31.2 (45)	.021
No	63.3 (124)	50.8 (32)	68.8 (99)	

\*  $p \leq .05$  is considered statistically significant

**Table 4: Oral Health Characteristics vs. Gender Identity**

	All (n=221)	Cisgender (n=166)	Transgender (n=55)	p- value*
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<b>During the past 12 months, did your teeth or mouth cause any pain or discomfort?</b>				
Yes	41.0 (87)	40.4 (65)	43.1 (22)	.852
No	59.0 (125)	59.6 (96)	56.9 (29)	
<b>How would you describe the current state of your teeth and gums?</b>				
Excellent	8.1 (17)	8.3 (13)	7.3 (4)	.326
Very Good	16.6 (35)	17.9 (28)	12.7 (7)	
Good	23.7 (50)	23.7 (37)	23.6 (13)	
Average	28.9 (61)	27.6 (43)	32.7 (18)	
Poor	15.6 (33)	13.5 (21)	21.8 (12)	
Very Poor	7.1 (15)	9.0 (14)	1.8 (1)	
<b>How often do you brush your teeth?</b>	6.3 (1.01)	6.4 (1.09)	6.2 (.74)	.180
<b>How often do you floss?</b>	3.6 (2.17)	3.6 (2.21)	3.6 (2.07)	.979
<b>Do you use a toothpaste that contains fluoride to brush your teeth?</b>				
Yes	69.0 (149)	69.6 (112)	67.3 (37)	.926
No	9.26 (20)	9.32 (15)	9.09 (5)	
Don't Know	21.8 (47)	21.1 (34)	23.6 (13)	
<b>I value keeping my mouth healthy.</b>				
Strongly Agree	79.1 (170)	81.5 (132)	71.7 (38)	.070
Somewhat Agree	18.6 (40)	16.0 (26)	26.4 (14)	
Somewhat Disagree	1.8 (4)	2.5 (4)	0.0 (0)	
Strongly Disagree	0.5 (1)	0.0 (0)	1.9 (1)	
<b>How long is it since you last saw a dentist?</b>	2.4 (1.47)	2.1 (1.36)	2.5 (1.49)	.099
<b>What was the reason for your last visit to the dentist?</b>				
Routine check-up/exam/cleaning	63.5 (134)	64.1 (98)	60.8 (31)	.886
Pain/trouble with teeth, gums, or mouth	17.1 (36)	17.0 (26)	17.6 (9)	
Treatment/follow-up treatment	18.5 (39)	17.6 (27)	21.6 (11)	
Consultation/advice	.95 (2)	1.31 (2)	0 (0)	
<b>Do you have a single dentist or dental office that is your usual source of dental care?</b>				
Yes	61.8 (134)	60.4 (96)	66.0 (33)	.585
No	38.2 (83)	39.6 (63)	34.0 (17)	
<b>Do you currently have dental insurance?</b>				
Yes	78.3 (166)	75.0 (114)	86.5 (45)	.124
No	21.7 (46)	25.0 (38)	13.5 (7)	
<b>During the past 12 months, was there a time when you needed dental care but could not get it at that time?</b>				
Yes	32.2 (68)	34.0 (52)	25.5 (13)	.340
No	67.8 (143)	66.0 (101)	74.5 (38)	

<b>Do you currently have any oral health needs that are unmet?</b>				
Yes	36.7 (76)	38.7 (60)	30.4 (14)	.397
No	63.3 (131)	61.3 (95)	69.6 (32)	

\*  $p \leq .05$  is considered statistically significant

**Table 5: Oral Health Characteristics vs. Sexual Orientation**

	Straight (n=89)	Gay/Lesbian (n=72)	Bi/Pansexual (n=41)	Other (n=15)	p- value*
<b>During the past 12 months, did your teeth or mouth cause any pain or discomfort?</b>					.048
Yes	40.2 (35)	30.0 (21)	52.6 (20)	61.5 (8)	
No	59.8 (52)	70.0 (49)	47.4 (18)	38.5 (5)	
<b>How would you describe the current state of your teeth and gums?</b>	3.2 (1.33)	3.8 (1.26)	3.6 (1.46)	3.1 (1.10)	.028
<b>How often do you brush your teeth?</b>	6.4 (1.09)	6.4 (.92)	6.2 (.072)	5.9 (.74)	.103
<b>How often do you floss?</b>	3.7 (2.23)	3.7 (2.04)	3.3 (2.12)	3.7 (2.33)	.669
<b>Do you use a toothpaste that contains fluoride to brush your teeth?</b>					.878
Yes	69.0 (58)	72.2 (52)	61.0 (25)	66.7 (10)	
No	11.9 (10)	8.33 (6)	12.2 (5)	6.67 (1)	
Don't Know	19.0 (16)	19.4 (16)	26.8 (11)	26.7 (4)	
<b>I value keeping my mouth healthy.</b>					.025
Strongly Agree	81.8 (72)	85.9 (61)	68.3 (28)	60.0 (9)	
Somewhat Agree	14.8 (13)	14.1 (10)	29.3 (12)	33.3 (5)	
Somewhat Disagree	3.4 (3)	0.0 (0)	2.4 (1)	0.0 (0)	
Strongly Disagree	0.0 (0)	0.0 (0)	0.0 (0)	6.7 (1)	
<b>How long is it since you last saw a dentist?</b>	2.6 (1.53)	2.3 (1.45)	2.5 (1.38)	2.1 (1.51)	.617
<b>What was the reason for your last visit to the dentist?</b>					N/A
Routine check-up/exam/cleaning	57.3 (47)	72.1 (49)	61.5 (24)	57.1 (8)	
Pain/trouble with teeth, gums, or mouth	20.7 (17)	10.3 (7)	23.1 (9)	7.14 (1)	
Treatment/follow-up treatment	22.0 (18)	14.7 (10)	15.4 (6)	35.7 (5)	
Consultation/advice	0 (0)	2.94 (2)	0 (0)	0 (0)	
<b>Do you have a single dentist or dental office that is your usual source of dental care?</b>					.494
Yes	56.5 (48)	67.6 (48)	65.8 (25)	66.7 (10)	
No	43.5 (37)	32.4 (23)	34.2 (13)	33.3 (5)	
<b>Do you currently have dental insurance?</b>					.405
Yes	74.1 (60)	78.3 (54)	87.5 (35)	80.0 (12)	
No	25.9 (21)	21.7 (15)	12.5 (5)	20.0 (3)	

<b>During the past 12 months, was there a time when you needed dental care but could not get it at that time?</b>					
Yes	33.8 (27)	28.6 (20)	35.1 (13)	23.1 (3)	.791
No	66.2 (53)	71.4 (50)	64.9 (24)	76.9 (10)	
<b>Do you currently have any oral health needs that are unmet?</b>					
Yes	42.0 (34)	27.5 (19)	42.2 (14)	38.5 (5)	.251
No	58.0 (47)	72.5 (50)	57.6 (19)	61.5 (8)	

\*  $p < .05$  is considered statistically significant

**Table 6: Unmet Oral Health Need by Demographic Categories**

	All (n=229)	Unmet Oral Health (n=76)	No Unmet Oral Health (n=131)	p- value*
<b>Age</b>				
Under 25	15.6 (32)	12.2 (9)	17.6 (23)	.151
25-34	27.8 (57)	28.4 (21)	27.5 (36)	
35-44	17.1 (35)	18.9 (14)	16.0 (21)	
45-54	18.1 (37)	16.2 (12)	19.1 (25)	
55-64	14.6 (30)	21.6 (16)	10.7 (14)	
65+	6.8 (14)	2.7 (2)	9.2 (12)	
<b>Race</b>				
White	62.1 (126)	55.4 (41)	65.9 (85)	.330
Black/African American	22.2 (45)	25.7 (19)	20.2 (26)	
Other/Mixed	15.8 (32)	18.9 (14)	13.9 (18)	
<b>Hispanic/Latino</b>				
Yes	11.2 (23)	13.3 (10)	10.0 (13)	.466
No	88.8 (182)	86.7 (65)	90.0 (117)	
<b>Education</b>				
Less than high school	4.5 (9)	5.5 (4)	4.0 (5)	.246
High school but no diploma	11.6 (23)	12.3 (9)	11.1 (14)	
High school graduate/GED	25.6 (51)	21.9 (16)	27.8 (35)	
Some college but no degree	24.1 (48)	32.9 (24)	19.0 (24)	
Associates degree	9.1 (18)	5.5 (4)	11.1 (14)	
Bachelor's degree or higher	25.1 (50)	21.9 (16)	27.0 (34)	
<b>Household income</b>				
Under \$20,000	50.8 (99)	61.6 (45)	44.3 (54)	.062
\$20,001 - \$40,000	21.5 (42)	21.9 (16)	21.3 (26)	
\$40,001 - \$70,000	15.4 (30)	11.0 (16)	18.0 (22)	
\$70,001 - \$100,000	7.2 (14)	4.1 (3)	9.0 (11)	
\$100,001 or more	5.1 (10)	1.4 (1)	7.4 (9)	
<b>Tobacco use</b>				
Yes	45.9 (101)	56.2 (41)	40.0 (50)	.028
No	54.1 (119)	43.8 (32)	60.0 (75)	

\* $p < .05$  is considered statistically significant

## Appendix A

### ORAL HEALTH SURVEY

# Oral Health Survey

All answers are self-report and will remain anonymous

1. What specific services do you receive? (please check all that apply)
  - Medical Case Management
  - HIV/STD Testing Clinic
  - Primary Medical Care Services
  - Behavioral Health Services
  - Other: \_\_\_\_\_
  
2. What is your gender identification?
 

<ul style="list-style-type: none"> <li><input type="radio"/> Male</li> <li><input type="radio"/> Female</li> <li><input type="radio"/> Transgender male to female</li> </ul>	<ul style="list-style-type: none"> <li><input type="radio"/> Transgender female to male</li> <li><input type="radio"/> I identify as _____</li> </ul>
--	---
  
3. What is your age?
 

<ul style="list-style-type: none"> <li><input type="radio"/> 12-18</li> <li><input type="radio"/> 19-24</li> <li><input type="radio"/> 25-34</li> <li><input type="radio"/> 35-44</li> </ul>	<ul style="list-style-type: none"> <li><input type="radio"/> 45-54</li> <li><input type="radio"/> 55-64</li> <li><input type="radio"/> 65 or older</li> </ul>
--	---
  
4. Are you Hispanic/Latino?
  - Yes
  - No



5. What race best describes you?
- American Indian/Alaska Native
  - Asian
  - Black/African American
  - Native Hawaiian/Pacific Islander
  - White
  - Other
6. What is your sexual orientation?
- Gay/Lesbian
  - Straight
  - Bisexual
  - Pansexual
  - Asexual
  - I identify as \_\_\_\_\_
7. What level of education have you completed?
- Less than high school
  - High school but no diploma
  - High school graduate/GED
  - Some college but no degree
  - Associate degree
  - Bachelor's degree or higher
8. What is your approximate average household income?
- \$0 - \$20,000
  - \$20,001 - \$40,000
  - \$40,001 - \$70,000
  - \$70,001 - \$100,000
  - \$100,001 or more
9. How often do you use any type of tobacco products (cigarettes, vapes, cigars, chewing tobacco, pipe, snuff, etc.)?
- Every day
  - Several times a week
  - Once a week
  - Several times a month
  - Seldom
  - Never

10. What are the **first three digits** of your ZIP code? \_\_\_\_\_ X X

### Oral Health Questions

1. During the past 12 months, did your teeth or mouth cause any pain or discomfort?

- Yes
- No
- Don't know

2. How would you describe the current state of your teeth and gums?

- Excellent
- Very good
- Good
- Average
- Poor
- Very poor
- Don't know

3. How often do you brush your teeth?

- Never
- Once a month
- 2-3 times a month
- Once a week
- 2-6 times a week
- Once a day
- Twice a day

4. How often do you floss?

- Never
- Once a month
- 2-3 times a month
- Once a week
- 2-6 times a week
- Once a day
- Twice a day





5. Do you use a toothpaste that contains fluoride to brush your teeth?
- Yes
  - No
  - Don't know
6. I value keeping my mouth healthy
- Strongly Agree
  - Somewhat Agree
  - Somewhat Disagree
  - Strongly Disagree
7. How long is it since you last saw a dentist?
- Less than 6 months
  - 6-12 months
  - More than 1 year but less than 2 years
  - 2 years or more but less than 5 years
  - 5 years or more
  - Never received dental care
8. What was the reason for your last visit to the dentist?
- Routine check-up/exam/cleaning
  - Pain or trouble with teeth, gums, or mouth
  - Treatment/follow-up treatment
  - Consultation/advice
  - Don't know/don't remember
9. Do you have a single dentist or dental office that is your usual source of dental care?
- Yes
  - No
  - Don't know
10. Do you currently have **dental** insurance?
- Yes
  - No



Don't know

11. During the past 12 months, was there a time when you needed dental care but could not get it at that time?

Yes

No

Don't know

12. Do you currently have any oral health needs that are unmet?

Yes

No

Don't know

13. If you answered yes to the previous question, what are your unmet oral health needs?

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## ACADEMIC VITA

### Alexandra A. Wagner

#### EDUCATION

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##### **Integrated Undergraduate Graduate Degree Program (5-year program)**

##### **Penn State College of Medicine**

M.P.H., Global Health track

##### **Penn State University, Schreyer Honors College**

B.S. Biobehavioral Health, Minors: Global Health and Spanish

Hershey, PA  
August 2018 – May 2020

University Park, PA  
August 2015 – May 2019

##### **Ruaha Catholic University**

6-week Study Abroad, completed 6 Penn State credits

##### **Schreyer Globalization Program**

6-week program, completed 4 Penn State credits

Iringa, Tanzania

Summer 2018

Brazil and Colombia

Summer 2016

#### PUBLIC HEALTH EXPERIENCE

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##### **Penn State College of Medicine – Department of Family and Community Medicine**

Hershey, PA

##### *Human Research Technologist*

October 2019 – Present

- Lead a research team of over ten investigators on two grant-funded social determinant of health projects
- Conduct focus groups and interviews with interprofessional populations including clinical providers and patients
- Manage data collection, storage, and analysis in accordance with IRB guidelines for 5+ research studies

##### *Graduate Researcher*

September 2019 – Present

- Investigate the relationship between LGBTQ+ and HIV/AIDS status on oral health outcomes in southcentral PA
- Maintain partnership with underserved specialty clinic to collect novel survey data across their patient population
- Advocate for dental services for vulnerable LGBTQ+ and HIV/AIDS populations via dissemination of findings

##### *Research Support Assistant*

May 2019 – October 2019

- Implemented a growing number of oral health improvement projects in partnership with community organizations
- Conducted qualitative and quantitative data analyses of human subject data
- Disseminated research findings via preparing manuscripts for publication and presenting findings to stakeholders

##### **Centers for Disease Control and Prevention – Public Health Emergency Preparedness**

Virtual

##### *Virtual Student Federal Service Intern*

September 2019 – Present

- Design 3-hour webinar on RealOpt software to be delivered to public health department leaders across the U.S.
- Produce education materials to enhance emergency preparedness expert “Train the Trainer” courses

##### **Communication Sciences and Antibiotic Resistance Lab – University Health Services**

State College, PA

##### *Research Assistant*

January 2019 – May 2019

- Reviewed treatment plans and educated patients on using medication reminder application
- Qualitatively coded patient-provider appointment transcripts identifying diagnostic wordage and timing

##### **Penn State University Health Services**

State College, PA

##### *Clinic Intern*

January 2018 – January 2019

- Collected patient vital signs and performed health screenings including vision, eye, and urine tests
- Gathered patient medical histories and input information into electronic health record

**Global Health Fieldwork Community Needs Assessment**

Iringa, Tanzania

*Project Coordinator*

Summer 2018

- Identified stunting as a high-priority regional health concern via extensive research with community leaders
- Developed a proposed nutritional education plan targeting mothers with children under-two
- Presented fully developed public health program to local students, faculty and community stakeholders

**Global Entrepreneurship Week Penn State mHealth Challenge**

State College, PA

*Semifinalist*

October 2016 – November 2016

- Developed mobile app intervention and prototype targeting postpartum depression among high-risk mothers
- Pitched prospective program and app prototype to panel of community stakeholders

**Hurricane Harvey Disaster Relief Trip**

Beaumont, TX

*Volunteer*

March 2018

- Provided assistance to low SES households with severe home damage via debris removal and property gutting

**LEADERSHIP AND EVENT PLANNING**

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**Schreyer Honors College Distinguished Honors Faculty Program**

State College, PA

*Lead Faculty Assistant*

October 2015 – May 2019

- Developed innovative, interactive programs alongside honors faculty for scholar education and enrichment
- Led three faculty assistants in the planning, coordination, and execution of over 40 events a year
- Gathered and tracked various program data and implemented relevant quality improvement initiatives

**Penn State Dance Marathon - Family Relations Committee**

State College, PA

*Family Events Coordinator – Explorers Program Coordinator*

September 2018 – May 2019

- Partnered with 17 community organizations and led each partner in the development of a signature event
- Registered over 615 family members and directed volunteer staff in day-of program execution

**College of Health and Human Development**

State College, PA

*Ambassador*

November 2016 – May 2019

- Served as professional college and major representative at a variety of alumni and prospective student events
- Brainstormed new program and event ideas with Associate Dean for Undergraduate Students and Outreach

**Penn State Dance Marathon - Special Events Committee**

State College, PA

*THON Weekend Captain*

September 2017 – May 2018

- Guided Penn State Athletics in the development of “Athlete Hour” event for children impacted by cancer
- Led twenty committees of 30+ individuals each in developing signature events to be hosted THON Weekend

**State College Friends School Summer Camp**

State College, PA

*Assistant Director and Lead Counselor*

June 2017 – August 2018

- Developed camp schedule, activities, and field trips according to weekly themes
- Led team of 10+ lead and assistant counselors as well as 40+ campers aged five through ten

**PRESENTATIONS**

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Wagner, A (2019). *Integrating Oral Health into Medical School Curricula – Findings from Five Stand-Out Programs*. Family Medicine Education Consortium Annual Meeting, Lancaster, PA. (poster session)

Wagner, A (2019). *Teaching Oral Health to Medical Students via a Health Equity Clerkship*. 47<sup>th</sup> North American Primary Care Research Group Annual Meeting, Toronto, ON, Canada. (poster session)

**Grants, Honors and Awards**

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Community Relations Health Project Grant, Penn State Health Community Relations (\$5000)	November 2019
Fasola Family Trustee Scholarship, Schreyer Honors College	August 2019
Edith Pitt Chace Award, Penn State College of Health and Human Development	April 2019
Schreyer International Scholarship, Schreyer Honors College	March 2018
Whole World Scholarship, Penn State Education Abroad Office	March 2018
Society of Distinguished Alumni Trustee Scholarship, Penn State Alumni Association	September 2017, 2018
Spanish Basic and Intermediate Language Program Certificate of Excellence in Spanish Studies, Penn State Department of Spanish, Italian, and Portuguese	April 2016
W&K Donato Honors Scholarship, Schreyer Honors College	August 2016
George S. Wykoff Award, State College Area High School	May 2015