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Microcephaly Surge in Brazil Linked to Zika: A Review of the Literature.

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Microcephaly is not a common condition; however, rates of this condition can be more prominent in less developed countries. Brazil particularly saw a surge of this condition in the years 2015-2016. This surge has been linked to an increase in the Zika virus in the area. To understand this connection, it is important to know what microcephaly is, what Zika is, how Zika can cause microcephaly, and why Brazil had this surge of Zika and therefore a surge in microcephaly. Once these components are understood, a connection can be seen between the presence of Zika and the number of microcephaly cases.

Microcephaly is "a condition in which a baby's head is much smaller than expected" (Centers for Disease Control, 2016). In a standard pregnancy, while the fetus is growing, its brain is growing. A baby with microcephaly has a brain that has either not fully developed or has stopped growing at birth and this can result in a smaller head circumference. Like most congenital conditions, microcephaly can coexist with other conditions. Some of those conditions can include: seizures, intellectual disability, deficits in balance and movement, trouble swallowing, and loss of hearing and vision (Centers for Disease Control, 2016). The number of these coexisting conditions will vary as the severity of the condition varies. A baby with very mild microcephaly could have no coexisting conditions, whereas, a baby with severe microcephaly could have numerous coexisting conditions. Although this condition can have a significant effect on the life of the babies who are born with it, it is only affects between 2 and 12 babies per 10,000 babies (McNeil, D., 2016).

There are various known causes of microcephaly. The most common cause of microcephaly is the fetus's exposure to alcohol, certain drugs, or toxic chemicals while in the womb. These substances can stunt the growth of the fetus in crucial times of development. Severe malnutrition of the mother can cause the fetus to not get enough nutrients and food to develop properly. Infections like rubella, toxoplasmosis, and cytomegalovirus can contribute to microcephaly in a baby. Interruption of blood supply to the fetus's brain before or during birth can cause the brain to be undeveloped and in turn cause a smaller head circumference that is microcephaly. Finally, the influx of Zika in the past couple of years has been linked to microcephaly. Some mothers who have been infected with the Zika virus while pregnant have seen a stunted growth in the brains in their newborns.

A diagnosis of microcephaly can be made either during the pregnancy or after the baby has been born. If the diagnosis is made during pregnancy, an ultrasound is done towards the end of the second trimester or the beginning of the third semester. The ultrasound would show if the fetus' brain is growing at a normal rate or if its development has been stopped. If the diagnosis is made after the baby is born, the doctor measures the circumference of the newborn's head and relates this measurement to population values organized by sex and age. The diagnostic measurement for microcephaly is below 2 standard deviations below the average (Boston Children's Hospital, 2017). Because the reference charts that are used to compare the measurements to are taken before 24 hours of age, the head circumference measurements by the doctor should be done within these first hours of life. Another tool used to see the develop of the newborn baby's brain is to take a Magnetic Resonance Image (MRI) of the infant's brain to determine if the newborn baby had an infection during the pregnancy and to see if the development of the brain is normal.

There is no known cure for microcephaly because the brain damage done before birth is permanent. Microcephaly is a lifelong condition and because it can range from mild to severe, the treatment options can vary as well. Treatment for mild microcephaly involves routine check-ups performed on the baby to monitor its growth and development. Treatment for severe microcephaly includes developmental services in the child's life to help to improve their physical and intellectual abilities as they grow up. These types of services can include occupational therapy, physical therapy, and speech therapy. Medications can also be used to control seizures and other symptoms that can coexist with microcephaly.

When the number of Zika cases spiked in 2015, the number of microcephaly cases spiked as well. To make this correlation, it is important to understand what Zika is and how it can cause an underdevelopment in the brain in a developing fetus. Zika is a type of virus that is spread by contact with the *Aedes egypti* mosquito (McNeil, D., 2016). Zika can be spread in a variety of ways, some of which are: having sex with a person who has Zika, a pregnant woman passing it to her fetus during pregnancy or birth, or by blood transfusion. Once Zika is spread to an individual, these symptoms may develop: fever, rash headache, joint pain, conjunctivitis, and muscle pain. If an individual does develop symptoms, they can last for up to a week. A majority of those who are infected with Zika can have very mild symptoms or experience no symptoms at all.

It is important for an individual who thinks they could have contracted the virus to get tested for it. Zika can remain in the blood of a person for about a week (McNeil, D., 2016**).** To get tested, a person will have to go to the doctor and get a blood test. If a person does test positive for Zika, then he or she is likely to be protected from future infections. A pregnant woman should get tested if she traveled to an area with a risk of Zika, if she had sex with someone who lived or traveled to one of those areas, if she lives in an area that has a risk of Zika, or if she began experiencing symptoms **(**Centers for Disease Control, 2016**).**

There is no vaccine for the Zika virus, however, it can be beneficial to treat the symptoms. It is important to get plenty of rest, drink lots of fluid, and take acetaminophen to reduce any fever or pain. It is not recommended to take any kind of NSAID until Dengue is ruled out in a blood test because it can increase the risk of bleeding. If an individual is taking care of someone with Zika, he or she should not touch any blood or bodily fluids with exposed skin, wash his or her hands with soap and water after providing care, and remove and wash any clothes with blood or bodily fluids on them. Along with looking at the treatment of Zika, it is important to look at ways to prevent the virus as well. Preventive measures can include wearing long-sleeved shirts and long pants, staying in places with air conditioning and windows and door screens, treating clothing with permethrin, and using EPA insect repellants. (Zika Virus, 2017). Pregnant women should be extra cautious when it comes to working to prevent Zika. They should use insect repellent that is safe for them, they should not travel to any areas with a risk of Zika, and they should postpone traveling to cautionary areas in the U.S.

With an understanding of microcephaly and Zika, a connection can now be drawn between the two. Congenital Zika syndrome is a unique pattern of birth defects found among fetuses and babies infected with Zika virus during pregnancy. This syndrome has five distinct features: severe microcephaly where the skull has partially collapsed, decreased brain tissue with a specific pattern of brain damage, damage to the back of the eye, limited range of motion in the joints, and too much muscle tone, which restricts body movement after birth (Centers for Disease Control, 2016). Not every child who has this syndrome has these features and not all pregnant women who have the Zika virus have babies with microcephaly, although it does increase their chances. To infiltrate a cell, Zika needs the presence of AXL receptor tyrosine kinase (AXL). The AXL cells cover stem cells in the developing brain and in cells that form the blood vessels that make their way into the brain and neural cells (Greenwood, V., 2016). Neural stem cells are particularly vulnerable to the Zika virus, whereas mature neural cells are not.

Fisher and DeRisi researched the way in which Zika is able to enter neural stem cells. They took brain slices from fetuses and placentas from first and second trimester pregnancies. These brain slices are representative of the “battleground” between the Zika virus and the fetus. They exposed the samples to Zika for 24 hours and then proceeded to add a fluorescent tag that attaches to the virus. The researchers also took the placenta and looked at whether the cells would pick up the Zika virus. The cells from placenta did show traces of the virus in them and therefore were deemed vulnerable to Zika. From this the researchers determined that the first trimester is the time where the fetus will be more susceptible to Zika than the second semester. The researchers then went back to the brain cells and looked at which types of cells picked up the virus and whether they have AXL receptors. The virus ended up getting into the neural stem cells in various area of the brain and infected a few neurons, which they attributed to the neurons descending from infected stem cells. The virus also infected the astrocytes, which guide the neurons’ growth and transport nutrients around the brain. A molecule was added to some of the cells to block the AXL receptors to see if this kept the virus out and it did. Overall, fewer stem cells mean fewer neurons are developed and this leads to smaller brains. Many infected astrocytes can cause mature neuron death. There are still more questions that need to be answered from this research. For example, why is it that Dengue uses the same AXL receptors to enter cells, but does not cause the birth defects that Zika does. This could be attributed to the fact that the AXL receptors only allow specific conditions to enter, such as: mother’s genes, the state of the mother’s immune system, or if the mother has had the infection before. Fisher and DeRisi also put cells infected with Zika in a dish and treated them with different drugs. They found that Azirthromysoin stopped the virus from multiplying and it is a drug that is safe for pregnant women (Greenwood, V., 2016).

With a connection established between Zika and microcephaly, the spike of microcephaly cases in Brazil in 2015 can now be discussed. Because some of the poorer populations in Brazil live in areas with open gutters and piles of wet garbage, they are more prone to getting the

Zika virus. Living in these areas in Brazil gives them more exposure to mosquitoes, particularly *Aedes egypti* mosquitos. This population also tends not to be vaccinated against rubella, live in an area where feral cats roam, have the potential to be poisoned by industrial chemicals, and suffer from malnourishment, therefore, these factors also put them at a higher risk for contracting Zika. They are also less likely to give birth in a hospital. The surge in Brazil was more prominent in other South American and Asian countries because it took place in a hospital (McNeil, D., 2016). These other countries are not as developed and most births occur on the floor in the home. A typical Brazilian community has unfinished houses, windows with no screens, no climate control, flat roofs where water gathers, dirt side streets where water pools and attracts mosquitos. The locations where some Brazilian residents choose to live also tends to have poor foundations for housing. These locations are typically chosen because the residents need to live as close to work as possible. This need to live near work to keep their job overpowers the need to live in sanitary housing conditions and these inadequate social and economic conditions can create the ideal environment for an epidemic to occur (Gupta, S., 2016).

The surge of Zika in Brazil was first discovered in May of 2015, although, it was introduced to Brazil in July of 2014 at the World Cup. Seventy percent of all Zika-related microcephaly cases in Brazil resulted from the first wave of infections of 2015. This first wave began on January 1, 2015 in the northeastern part of Brazil and affected 49.9 out of 10,000 live births, compared to typical 2-12 out of 10,000 live births. The second wave was a lot smaller and it began on November 12, 2016 and dispersed across the whole country for a total of 3.2-15 out of 10,000 live births. There were 1,950 cases of Zika-related cases of microcephaly in 2015-2016 in Brazil (Soucheray, S., 2017).

Many of the mothers who were affected by Zika in Brazil brought their babies with microcephaly to a hospital in Brazil and the babies were given therapy. Doctors would do things like put glasses on the babies multiple times throughout the day to try to get them to open their

eyes, dangle black and white toys in front to them to try to elicit excitement, and cover balloons with shaving cream to encourage the babies to use their senses and help develop their brain. One doctor commented, “I am quickly drawn to 7-month-old baby Julia, a chubby darling with wide brown eyes. She seems to be sitting up straighter, and managing to hold her head up higher than other babies in the room. It’s a skill they should have all mastered by three months of age” **(**Gupta, S., 2016). This doctor was one that was working with the babies with microcephaly in a hospital in Brazil and highlights how slow the development can be for a baby with microcephaly, but how therapy can help them develop typical skills for their age.

Overall, Zika has been shown to be responsible for some of the microcephaly cases across the world. In the years 2015-2016, Zika particularly surged in Brazil and caused an influx in the amount of microcephaly cases. Zika is the only virus that can cross the placenta and cause birth defects. The reason for this is still unknown, but the virus has been shown the get in through the AXL receptors on the fetus’s neural stem cells. If the fetus’s neural stem cells are dying, then they will have a smaller sized head. Brazil is more susceptible to this virus because of the conditions the poorer populations live in. There is no cure for Zika or microcephaly, but preventative measures can be taken to avoid both.

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Associations Between Social Media and Well-Being and Sleep Quality in Medical and Health Professions.

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Abstract

This study was conducted to assess associations between social media use and overall well-being and sleep quality in medical and health professions graduate students. A cross-sectional survey was distributed to examine demographic information, social media use, and health behaviors and outcomes. Logistic regression analysis was conducted to examine the relationships between sleep quality and potential covariates and/or independent variables, while proportional odds regression was performed to analyze potential associations between emotional well-being and independent variables. Survey respondents were more likely to have a low or depressed mood if they used social media as a way to help them sleep [odds ratio=2.1, 95% confidence interval = (1.0, 4.2)]. Participants who used social media to help them sleep also had poorer sleep quality than those who did not use social media for that purpose [odds ratio=2.3, 95% confidence interval= (1.1, 4.7)]. In addition,

individuals who used social media to obtain health-related advice or information were 2.8 times [95% confidence interval= (1.4, 5.8)] more likely to have poor sleep quality compared to those who did not use social media for health-related advice or information. These study results expound upon the relationship between social media use and health outcomes in medical and graduate students.

Introduction

For this generation, and likely for other generations after it, a significant portion of their social and emotional attachments will develop over the Internet. The Internet and social networking sites can have a significant effect on many of the health concerns associated with young people, such as aggressive behavior, substance abuse, and disordered eating (Sidani, Shensa, Hoffman, Hanmer, & Primack, 2016; Strasburger, Jordan, & Donnerstein, 2010). A 2014 research study found that the average American college undergraduate student spends over four hours per week on social media sites, with significant associations between social networking and body mass indexes and sleep (Melton, Bigham, Bland, Bird, & Fairman, 2014). Current researchers believe that this amount of social media use is vastly underestimated. Regardless of the amount, media use and its effects on sleep patterns have been shown to have important effects on health and well-being in several age groups (Arora, Broglia, Thomas, & Taheri, 2014; Magee, Lee, & Vella, 2014).

Social media use has also been shown to have effects on quality of life, of which emotional well-being is a major component. A previous study reported that using the Internet for sociability is positively correlated with several dimensions of social support, but inversely correlated with quality of life because online interactions are not as substantial or enduring as in-person communication (Leung & Lee, 2005). Labrague (2014) found that time spent on social media websites, especially Facebook, increases a subject's scores on a depression and anxiety

questionnaire, indicating an increased likelihood of having these conditions. Steers, Wickham, and Acitelli (2014) also established an association between time spent on Facebook and depressive symptoms for both men and women. These authors suggested that social media use increases depression, especially when it triggers feelings of envy or inferiority (Steers et al., 2014). According to another study, when 'Facebook envy' is controlled or limited, Facebook use can reduce depression (Tandoc, Ferrucci, & Duffy, 2015).

Several elements are associated with social media use and are risk factors for poor well-being and sleep, including physical activity level, fruit and vegetable intake, smoking status, and alcohol consumption. Researchers postulated that media use and physical activity may have competing roles in the lives of adolescents and reported that boys and girls with high media usage were also in low physical activity groups. However, those who were highly physically active also had very high media use, especially for males (Spengler, Mess, & Woll, 2015). This indicates that social media use plays a large role in the lives of youth today and that there may be gender-based differences in the relationship between media use and physical activity. Moreover, a randomized controlled trial of individuals with insomnia demonstrated that increased physical activity-meeting the World Health Organization (WHO) recommended activity levels-significantly lowered insomnia, depression, and anxiety, while accounting for daily light exposure (Hartescu, Morgan, & Stevinson, 2015).

In addition to physical activity, nutrition has been linked to social media, well-being, and sleep. In recent years, researchers have discussed how restaurant chains and other industries utilize social media advertising to promote energy-dense, nutrient-poor (EDNP) food, drinks, and products to young adults (Freeman et al., 2014; Freeman, Kelly, Vandevijvere, & Baur, Epub 2015). This is troubling since research supports the belief that fruit and vegetable intake improves well-being and sleep (Mujcic & Oswald, 2016; Peuhkuri, Sihvola, & Korpela, 2012). Furthermore, tobacco companies have strategically designed and placed advertisements on social media to promote smoking, even at the risk of

being sanctioned by tobacco control agencies (Burton, Soboleva, & Khan, Epub 2014). Unfortunately, regulation of such content is poor, and the dangers and exposure to smoking promotion has only increased as tobacco corporations expand their social media marketing strategies and peers-intentionally or unintentionally-endorse pro-smoking messages and subsequent behaviors to their friends (Depue, Southwell, Betzner, & Walsh, 2015; Yoo, Yang, & Cho, 2016). Smoking has been associated with reduced subjective well-being and poorer sleep quality and quantity when compared to former and/or non-smokers (Barros, Kozasa, Formagini, Pereira, & Ronzani, 2015; Brook, Brook, & Zhang, 2014; Jaehne et al., 2012; McNamara et al., 2014). The literature cites similar outcomes for the negative impact of social media on alcohol use and the effect of alcohol on sleep and well-being (Boyle, LaBrie, Froidevaux, & Witkovic, 2016; Geoghegan, O'Donovan, & Lawlor, 2012; Hoffman, Pinkleton, Austin, & Reyes-Velazquez, 2014; Moreno & Whitehill, 2014; Thakkar, Sharma, & Sahota, 2015). These findings may have implications for graduate and medical students, since a recent study indicated that 93.4% (450/482) of medical students use social media, with 74.4% using Facebook daily (Avci, Celikden, Eren, & Aydenizoz, 2015). More research is needed to validate and expand upon these claims for children, teens, and adults. It is important to evaluate the current effects of social media use and influence on health indicators, as this knowledge will be helpful in research and for the health and safety of future healthcare professionals and their patients.

Purpose

This study was conducted to assess and understand associations between social media use and overall well-being and sleep quality in medical and health professions graduate students at an academic health center. Potential covariates, such as physical activity level, fruit and vegetable intake, smoking status, and alcohol consumption, were considered as well. The goals of this research include: 1) making medical and

health professions students and the community aware of health measures that are related to social media use and 2) providing recommendations, based upon the study results, that would maintain or improve health in those who provide healthcare services to others.

Materials and Methods

This cross-sectional survey was conducted during a period of 2 months (8 weeks) from the start date after Eastern Virginia Medical School Institutional Review Board approval (IRB # 15-12-XX-0237, approved on 8 January 2016). Participants were medical and graduate students at a medical school in Norfolk, Virginia who were between 20 and 54 years old and were enrolled at least part-time in a program at the medical school. Recruitment was conducted through a system-wide email announcement, including the link to the survey and the researchers' contact information.

Previously validated survey instruments were used to assess emotional well-being, sleep quality, and physical activity, while the research team created questions to evaluate nutrition and social media use and influence for the survey (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989; The IPAQ Group, 2005; WHO, n.d.). The questionnaire consisted of six domains: (1) Demographic information, (2) Emotional well-being, (3) Sleep quality, (4) Physical activity, (5) Nutrition, and (6) Social media use and influence. In the first domain, demographic data and general information were collected including age, gender, race, height, weight, and academic program. Race included the following choices: White, Black, Hispanic, Native American (including American Indian, Eskimo, and Aleut), Asian/Pacific Area [Pacific Area embraces Polynesian (including Hawaiian and Samoan), Micronesian (including Guamanian), and Melanesian], and other. Academic program determined if the participant was in the Medical Doctorate (MD), Master of Public Health (MPH), Art Therapy, Master's of Biomedical Sciences (Medical Master's), Biomedical

Sciences PhD (Biomedical PhD), Clinical Embryology, Physician Assistant, Surgical Assistant, Biomedical Science Research Master's (Biomedical MS), or other program.

The second domain was adapted from the WHO-5 Well-being Index and was used to measure students' emotional functioning (WHO, n.d.). The WHO-5 questions used a 6-point Likert scale, ranging from 0 (At no time) through 5 (All of the time). The raw score was calculated by summing the scores for each question. The final score was computed by multiplying the raw score by 4, so that the final score ranged from 0 (Depressed) to 100 (High mood). Well-being was operationalized into three categories, where a score of 0 to less than 29 indicated depression, a score from 29-50 signified low mood, and a score greater than 50 to 100 denoted a high mood. Poor well-being was synonymous with a score that indicated depression and, therefore, the health event of interest, while a high score (>50-100) denoted high mood and good well-being. The WHO-5 Well-being Index has high validity and reliability and has been a stable measure of well-being across several populations even when compared to other instruments, such as the Beck Depression Inventory II (Topp, Ostergaard, Sondergaard, & Bech, 2015). The third domain, which evaluated sleep quality, was adapted from the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989). The possible score was between 0 (Better) and 21 (Worse), with a score above 5 indicating poor sleep quality. It should be noted that the question about not being able to breathe comfortably and the set of questions regarding a bed partner or roommate from the original version of the survey were excluded from this study.

Regarding the fourth domain, the International Physical Activity Questionnaire (IPAQ) - Short Form was utilized to determine the physical activity behaviors of the participants (The IPAQ Group, 2005). Physical activity was measured in time spent being physically active during the past seven days. The measurements in hours and minutes were converted into MET-minutes. The metabolic equivalent of task, or METs, are

a quantification of the amount of energy required for an individual to complete an activity and this figure is multiplied by the length of time spent performing the activity to derive the MET-minutes. The total possible MET-minutes ranged from 0 to 19,278 MET-minutes per week, with a higher number indicating more physical activity. After MET-minutes were calculated, physical activity was categorized into one of three levels: low, moderate, or high, according to the IPAQ scoring instructions (The IPAQ Group, 2005).

The fifth domain concerning nutrition included questions on daily fruit and vegetable intake, and smoking and drinking habits. According to the United States Department of Agriculture (USDA) and the Office of Disease Prevention and Health Promotion (ODPHP) of the United States Department of Health and Human Services (HHS), Americans should strive to consume a minimum of 5-9 servings of fruits and vegetables per day (ODPHP, 2017; USDA, 2015a; USDA, 2015b). Five servings is the recommended amount for the lowest caloric intake (1,000 calories per day) (USDA, 2015a; USDA, 2015b). Survey participants were categorized as eating the minimum recommended amount of 5 servings or eating less than the recommended amount (0-4 servings) per day. Participants were asked if they smoked at least part of a cigarette in the last seven days and if so, how many cigarettes had they smoked per day, on average. Since there were so few smokers and those smokers either smoked only one or two cigarettes per day, the variable was treated as categorical in analysis. Survey respondents were also asked how many days they had had at least one drink of an alcoholic beverage in the past 30 days and on those days how many drinks they consumed, on average.

The sixth and final domain assessed social media use and influence by gathering information on daily amount of time spent on social media, social media use in the hour before bed, social media use as a way to help individuals sleep, and social media use to obtain health-related advice or information. For the purposes of this study, social media included Facebook, MySpace, Twitter, Instagram, email, various messenger

services, online dating applications, and any other non-gaming platforms where the participants could engage with others, regardless of how they were connecting (e.g. mobile phone, tablet, desktop computer, and laptop).

The survey was administered using Qualtrics, an online survey software (Provo, Utah, USA). This study was conducted in accordance with the Declaration of Helsinki. All members of the research team completed training in the Health Insurance Portability and Accountability Act (HIPAA) and Collaborative Institutional Training Initiative (CITI). Participation in the survey was voluntary and participants could terminate their involvement at any time. All participants were informed about the purpose of the study, what was required of them, and that they could terminate their participation at any time. Participants were contacted via their school emails, requesting their voluntary and anonymous participation. The emails were only sent to addresses with the institutional email domain and included a link to the survey. The email instructed the participants to take the survey only once, even though they may receive multiple reminder emails. In addition, participants were instructed not to share the link with other individuals. The survey was available for 8 weeks, with a reminder email sent on the 4-week deadline.

All data were reported in aggregate and confidentiality was protected. The main outcomes were emotional well-being and sleep quality. The independent variables included social media usage amounts in minutes per day, social media use before bed, social media use to aid sleep, and social media use to obtain health advice or information. The potential covariates that were examined were age, gender, race, body mass index (kg/m^2) as computed from the height and weight variables, academic program, physical activity, and nutrition as measured by fruit and vegetable intake, cigarette smoking, and alcohol consumption. Descriptive and summary statistics were calculated for all survey items. Means and standard deviations were calculated for normally distributed, continuous outcomes, medians and ranges were described for non-normally distributed outcomes, and frequencies and proportions were reported for categorical outcomes. Logistic regression analysis was conducted to

examine the relationships between sleep quality and potential covariates and/or independent variables, with poor sleep quality as the event. Proportional odds regression was performed to examine potential associations between emotional well-being and continuous variables or categorical independent variables. Probabilities modeled were cumulated over the lowered ordered values of well-being (1=Depressed, 2=Low mood, 3=High mood). A response of "No" was the reference group for the categorical independent variables pertaining to social media use. Potential associations between categorical covariates and the primary outcomes were assessed using Chi-squared analyses. All data analyses were executed using SAS 9.4 (Cary, North Carolina, USA.) with alpha equal to 0.05.

Results

Table 1 presents the sample characteristics. The survey response rate was 14.8% (165/1,118), with one survey being excluded as an extreme outlier, resulting in a total of 164 analyzed responses. Significantly more females than males participated in the survey, most respondents were White and the majority of them were students in the MD program. The "Other" category responses for race included "Bi-racial", "Mixed race", "Mixed White/Asian", and "Multiracial White/Asian", and the "Other" category responses for academic program included Laboratory Animal Science (LAS) and Medical and Health Professions Education (MHPE). None of the respondents identified themselves as Native American and there were no Biomedical Science Research Master's program students who completed the survey. The average age was approximately 28 years old and the average BMI was just below 25, which is the lower limit for the overweight category, according to the National Heart, Lung, and Blood Institute (NHLBI, NIH, n.d.). In addition, more than 60% of the participants had a low or moderate level of physical activity. No one reported eating nine or more servings of fruits and vegetables per day, but approximately 17% (24/139) of participants

did consume at least five fruits and vegetables per day. Less than 3% (4/140) of survey respondents smoked a cigarette in the last seven days and the median number of days alcohol was consumed in the past 30 days equaled four (see Table 1).

Table 1

Demographic Information of the 164 Survey Participants

Continuous variables	Mean (SD)
Age in years (n=161)	28.1 (6.0)
Weight in kilograms (n=161)	72.8 (17.6)
Height in meters (n=159)	1.7 (0.1)
BMI in kilograms/meter squared (n=159)	24.9 (5.2)
Non-normally distributed variables	**Median (Range)**
Number of Days Alcohol Consumed in Past 30 Days (n=138)	4.0 (0.0-28.0)
Number of Alcoholic Beverages Consumed Per Day (n=133)	2.0 (0.0-5.0)
Categorical variables	**Frequency (%)**
Gender (n=162)	
Female	105 (64.8)
Male	57 (35.2)
Race/Ethnicity (n=162)	
White	107 (66.0)
Black	14 (8.6)
Hispanic	9 (5.6)
Asian/Pacific Area	26 (16.0)
Other	6 (3.7)
Academic Program (n=162)	
MD	74 (45.7)
MPH	22 (13.6)

Art Therapy	3 (1.9)
Medical Master's	12 (7.4)
Biomedical PhD	5 (3.1)
Clinical Embryology	2 (1.2)
Physician Assistant	32 (19.8)
Surgical Assistant	8 (4.9)
Other	4 (2.5)
Physical Activity (n=164)[a]	
Low Activity	55 (33.5)
Moderate Activity	49 (29.9)
High Activity	60 (36.6)
Servings of Fruits & Vegetables Per Day (n=139)	
0-4 Servings	115 (82.7)
5 or More Servings	24 (17.3)
Smoked Cigarette(s) in Last Seven Days (n=140)	
Yes	4 (2.9)
No	136 (97.1)
Number of Cigarettes Smoked Per Day (n=4)	
One	1 (25.0)
Two	3 (75.0)

Note. [a]Adapted from "The International Physical Activity Questionnaire" by The IPAQ Group, 2005, Short Last 7 Days Self-Administered Format. Retrieved from http://www.ipaq.ki.se

Summary statistics for the main variables of interest are shown in Table 2. With regard to emotional well-being, most medical and graduate students reported being in a good mood in general, based on the WHO-5 outcomes. However, approximately half of the students indicated that they had poor sleep quality. With concern to social media use, survey respondents reported an average of about 58 minutes per

day on social media, with a minimum of zero and a maximum of 200 minutes on social media per day. Significantly more individuals used social media in the hour before going to bed, and less participants used social media to help them sleep and for health advice or information compared to those who did not (see Table 2).

Table 2

Independent and Dependent Variable Descriptive Statistics

Continuous outcomes	Mean (SD)
Social Media Use in Min Per Day (n=141)	57.7 (43.8)
Categorical outcomes	**Frequency (%)**
Well-being (n=157)[a]	
Depressed	11 (7.0)
Low Mood	46 (29.3)
Good Mood	100 (63.7)
Sleep Quality (n=145)[b]	
Poor Sleep Quality	73 (50.3)
Good Sleep Quality	72 (49.7)
Social Media Use in Hour Before Going to Bed (n=141)	
Yes	104 (73.8)
No	37 (26.2)
Social Media Use As A Way to Help You Sleep (n=141)	
Yes	47 (33.3)
No	94 (66.7)
Social Media Use to Obtain Health Advice or Information (n=141)	
Yes	53 (37.6)
No	88 (62.4)

Note. [a]Adapted from "WHO (Five) Well-being Index," by WHO, retrieved from http://www.WHO-5.org/. [b]Adapted from "The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research," by D. J. Buysse, C. F. Reynolds, III, T. H. Monk, S. R. Berman, and D. J. Kupfer, 1989, Psychiatry Research, 28(2), p. 209-210. Copyright 1989 by the University of Pittsburgh.

Analysis of potential associations between the aforementioned independent and dependent variables demonstrated that social media use to help one sleep was associated with well-being and sleep quality while social media use to obtain health advice or information was only related to sleep quality (see Table 3). Survey participants who used social media as a way to help them sleep were more likely to have a poor mood than those who did not use social media as a way to help them sleep [OR=2.1, 95% CI=(1.0, 4.2)]. Similarly, individuals who utilized social media as a way to help them sleep were 2.3 times [95% CI= (1.1, 4.7)] more likely to have poor sleep quality compared to those who did not use social media as a way to help them sleep. Additionally, participants who used social media to obtain health advice or information were 2.8 times [95% CI= (1.4, 5.8)] more likely to have poor sleep quality versus those who did not use social media to find health advice or information. However, social media use to obtain health advice or information was not significantly associated with well-being, and the number of minutes on social media per day and social media use in the hour before bed were not significantly related to self-reported well-being or sleep quality (see Table 3). Since no covariates were associated with sleep quality or well-being, there were no multivariate analyses required.

Table 3

Regression Results for Primary Outcomes and Independent Variables

Independent variable	Well-being (n=141)[a]	Sleep quality (n=138)[b]
Social Media Use in Minutes Per Day	1.0 [1.0, 1.0]	1.0 [1.0, 1.0]
Social Media Use in Hour Before Going to Bed (Reference: No)	1.2 [0.5, 2.5]	1.0 [0.5, 2.2]
Social Media Use As A Way to Help You Sleep (Reference: No)	2.1 [1.0, 4.2]*	2.3 [1.1, 4.7]*
Social Media Use to Obtain Health Advice or Information (Reference: No)	0.9 [0.5, 1.9]	2.8 [1.4, 5.8]*

Note. Data are presented as odds ratio [95% confidence interval]. Proportional odds regression was performed to analyze potential associations with emotional well-being, while logistic regression analysis was conducted to examine potential relationships with sleep quality. Probabilities modeled are cumulated over the lower ordered values, where 1=Depressed, 2=Low Mood, and 3=Good Mood for well-being. The event modeled for sleep quality is Poor Sleep Quality. [a]Adapted from "WHO (Five) Well-being Index," by WHO, retrieved from http://www.WHO-5.org/. [b]Adapted from "The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research," by D. J. Buysse, C. F. Reynolds, III, T. H. Monk, S. R. Berman, and D. J. Kupfer, 1989, Psychiatry Research, 28(2), p. 209-210. Copyright 1989 by the University of Pittsburgh. * $p < 0.05$.

Discussion

This study included survey respondents from a population of young to middle-aged adult medical and graduate students at an academic health center. Although previous studies have examined social media use in children and teenagers, it appears that young and middle-aged adults have been affected by the rapid technological advances and uses as well, as demonstrated by this study (Gradisar et al., 2013; Levenson, Shensa, Sidani, Colditz, & Primack, 2016; Melton et al., 2014; O'Keeffe, Clarke-Pearson, & Council on Communications and Media, 2011; Strasburger et al., 2010). Our study evaluated multiple aspects of health to analyze what effect, if any, social media had on those factors. The key

findings were (1) participants were more likely to have low emotional well-being if they used social media as a way to help them sleep, (2) participants' sleep quality was negatively associated with using social media to help one sleep, and (3) participants were more likely to have poor sleep quality if they used social media to obtain health advice or information.

Regarding the demographic characteristics of the sample, racial, gender, and academic program data were consistent with national medical, physician assistant, and art therapy applicant and matriculant data (Association of American Medical Colleges [AAMC], 2016; Deloitte, Macro Connections, & Datawheel, 2017; McHugo, 2016; Robohm-Leavitt, 2015). This does not necessarily coincide with the United States Census Bureau data for the region due to the well-documented dearth of Black and Hispanic individuals in medical and health professions. These groups are considered underrepresented populations in medical schools unlike Asian students who are a minority population for the country and region but not in health professions (AAMC, 2015; Goldsmith, Tran, & Tran, 2014; Saha, Taggart, Komaromy, & Bindman, 2000; U.S. Census Bureau, n.d.[c]; U.S. Census Bureau, n.d.[d]). Over time, female students have come to constitute the majority of health professions in general, which is reflected in this sample. Additionally, the medical school class size is larger than any of the health professions class sizes at the institution, which is emphasized by the percentage of medical students who completed the survey. Although socioeconomic status was not collected for this sample, census data indicates that residents of Norfolk, Virginia have a median household income of $44,480 and Virginia residents have a median income of $65,015 (U.S. Census Bureau, n.d.[a]; U.S. Census Bureau, n.d.[b]).

The majority of survey respondents reported being in a good emotional state. Yet, study results revealed that the individuals who utilized social media as an aid to help them sleep were more likely to have a depressed or low mood. Although our study did not explore the potential effect of negative emotions after social comparison (i.e. 'Facebook envy'), our results are in agreement with previous studies in at least

one respect, that is, social media use was negatively associated with emotional well-being (Labrague, 2014; Steers et al., 2014). Similarly, the outcomes of our study also suggest that medical and graduate students who engage on social media to help them sleep have poorer sleep outcomes. These results are consistent with a recent, nationally representative study of young adults' social media use and sleep, in which the authors found significant associations between social media use, measured by volume and frequency, and sleep disturbance (Levenson et al., 2016).

Being highly influenced by social media may also have a detrimental effect on sleep time and quality. The findings of this study indicate that sleep is negatively associated with social media use, even when the purpose for its use may be positive (i.e. seeking health advice). This result may be due to a hypochondriacal state known as cyberchondriasis, where individuals develop health anxiety from searching for health information on the internet (Muse, McManus, Leung, Meghreblian, & Williams, 2012). It is reasonable to hypothesize that this health anxiety could lead to poor sleep outcomes. Alternatively, individuals may spend time on social media instead of sleeping because of an emotional investment or attachment to social media (Woods & Scott, 2016). Regardless of the mechanism, sleep deprivation and poor sleep quality can substantially affect work performance and daily activities, with dire consequences when pertaining to medical professions (Institute of Medicine ([U.S.] Committee on Sleep Medicine and Research, 2006; Landrigan et al., 2004; Lockley et al., 2004). Therefore, it is essential that adults, especially medical and graduate students, remain cognizant of the amount of time that they spend on social media and how it may affect their sleep, overall health, and livelihood.

There were some limitations to this study. First, potential demographic features, such as socioeconomic status and relationship status, were not included in the data collection. Though the survey response rate was low, this response rate assumes that all recipients of the email

campus-wide actually opened the survey link, which might not be the case. Still, self-selection bias could have occurred due to the nature of the survey sampling method used, and this bias should be considered when attempting to extrapolate said results to the population of interest. The cross-sectional nature of the study did not allow us to definitively establish causality or examine whether changes in the dependent variables occurred over time. Therefore, potential improvements in sleep quality or well-being could lead to reduced social media use as well. Finally, inclusion of the two excluded questions from the PSQI questionnaire may have allowed for deeper understanding of how sleep is related to social media use. Sleep is of particular importance, especially during the rigorous training that occurs at medical institutions. Since several studies suggest that social media use negatively affects sleep time and quality, it would be appropriate to research the mechanisms and ways in which social media disrupts or prevents proper sleep in more depth (Arora et al., 2014; Gradisar et al., 2013; Hysing et al., 2015; Levenson et al., 2016; Magee et al., 2014). For example, future studies could examine whether the type of electronic device used or the purpose for social media engagement (e.g. relaxation, work-related use) are significant covariates in the association between sleep and social media use in medical and health professions graduate students.

In contrast with other studies, our analyses did not reveal any associations between demographic characteristics, physical activity level, or nutritional factors and well-being or sleep quality (Barros et al., 2015; Hartescu et al., 2015; Mack et al., 2012). However, this finding might be subjected to the small sample size or self-reporting bias. During survey creation and administration, measures were taken to reduce self-reporting bias. Previously validated instruments were utilized, where possible, and items related to social media use were stated clearly and in commonly used language to reduce ambiguity and confusion. Survey respondents were also notified that their responses would be anonymous and that no personal identifiers would be collected. Despite these precautions, demographic characteristics and the other potential covariates

were not significantly correlated with the outcomes. However, they may be important covariates in other populations. Other indices of health and academic and/or work performance could be examined to determine how social media use relates to them. Furthermore, additional measures of well-being or quality of life could be analyzed to confirm and further explore the psychological, emotional, and physical implications of social media use as a method to aid sleep. While previous studies have examined adolescents or undergraduate students, this study provided insight into social media use among graduate students of several health professions (Strasburger et al., 2010; Yoo et al., 2016). In addition, the definition of social media was more inclusive (i.e. the focus on more than one website or application) in this study than in previous research (Jha et al., 2016). Hence, graduate school faculty at our institution and similar institutions can use the results of this survey to promote the safe and effective use of social media and potentially improve associated health outcomes for forthcoming health professionals.

Conclusions

This survey allowed our research team to evaluate the relationships between social media use and influence and health-related measures in medical and graduate students at an academic health center. Results indicated that social media use as a way to help one sleep is a risk factor for poor emotional well-being and sleep quality, and social media use to obtain health information is negatively associated with sleep quality. High-quality sleep is important for future health professionals, especially since they have limited time and an extensive list of requirements to fulfill. Medical and health professions students should take precautions to minimize social media use and influence in order to attain better emotional well-being and sleep quality, perform to their highest standards, and be responsible medical professionals.

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Travel Illness Outbreak Investigation and Treatment among Interprofessional Health Team Members in Guatemala.

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Abstract

Purpose**:** Americans travel each year and acquire illnesses. Gastrointestinal illness is a common self-reported illness and has many associated risk factors. Students from a medical school in Virginia traveled to Guatemala to provide medical care. Overall, 1,250 patients were seen by the student doctors. An outbreak investigation was initiated when members of the medical team began experiencing illness. Methods**:** Food and water safety was inspected and inquiries were made about the health of other travelers staying at the same host. Furthermore, a voluntary brief survey was completed after returning to the United States. The index patient had seen a patient in the clinic with similar symptoms. An incubation period of 24-36 hours was established. Results**:** After an adequate kitchen inspection including both food and water distribution, it was determined the illness was being spread from person to person. The survey was administered to 93 travelers and 69 completed the survey. Symptoms were reported by 74% of survey respondents. There was no correlation to consumption of food and water. Conclusions**:** Prevention measures such as hand hygiene practices should be emphasized to prevent spread of the illness among medical travelers. Limitations include recall bias.

Purpose

The primary purpose of this research was to determine the cause of illness among the medical travelers and to determine best methods for future prevention. Disseminating results of the outbreak investigation is intended to provide information for the purpose of preventing illness in other traveling groups.

Illness while traveling is a significant public health problem. Millions of Americans travel each year, and many illnesses are acquired and self-reported by the travelers. Gastrointestinal illness is among the most commonly reported by travelers to Latin America (Flores-Figueroa, 2011; Leung 2018). A study by Flores-Figueroa et al. indicates that the majority of these illnesses are acquired acute unspecified diarrhea, followed by Giardia infection and acute bacterial diarrhea (Flores-Figueroa, 2011).

Many risk factors can be associated with gastrointestinal illness while traveling. These include dietary behaviors such as drinking tap water and eating food prepared in unhygienic conditions (Herwaldt 2018). Fecal-oral route transmissions are also common (Koo, 2010).

Research also indicates which pathogens are responsible for travel illnesses. The most common illness found among travelers is caused by enteroaggregative *Escherichia coli* (EAEC) and is commonly called travelers' diarrhea. Although the cause of forty percent of the published cases have not been determined, it is believed to have been originated from "undetected bacterial and nonbacterial enteropathogens" (Koo, 2010). Studies have also shown that noroviruses are another common cause of traveler's diarrhea. In a study of travelers to India, Mexico and Guatemala, "E.coli was seen in 52.9% of travelers where as NoVs were in 10.2% of travelers" (Koo, 2010; LaRocque, 2018).

Many healthcare providers and students who travel abroad are in direct contact with the patients at the clinics. In June 2017, 93 people consisting of physicians, medical students, nursing students and public health professionals embarked on a seven-day journey to serve in an international medical outreach trip to Guatemala from a Virginia university. The goal of this trip was to provide quality in both care to the underserved population and education to the students. There was opportunity for mentoring, both faculty to student and peer to peer, as students worked in teams taking care of patients. The medical team consisted of: four faculty physicians, six community physicians, sixty-four

medical students, three nurses, two of which were faculty, four master of nursing candidates, eight bachelor of nursing candidates, and two public health professionals (93 total). In addition, 35 community members traveled with the medical team, but had separate projects while in country. They did, however, have the same accommodations and meals. The age range was 12-71 years old with most students being between 20-35 years of age.

Student doctors had the opportunity to provide osteopathic medical care by examining, treating, and educating their patients. Specialties included pediatric medicine, general adult medicine and vision care; overall, 1,250 patients were seen consisting of men, women and children. A Christian non-profit organization supported this event by providing accommodations, meals and transportation to assist the students and faculty. The same accommodations were provided to the 35 community travelers. Prior to the trip, all travelers were advised to obtain the vaccines recommended by the Centers for Disease Control and Prevention for travelers to Guatemala. Further, hand hygiene and protective practices such as use of gloves in patient care were emphasized in training.

Methods

Members of the medical team began experiencing illness on the second day of the trip. Due to the symptoms among students, staff, and faculty, an outbreak investigation was initiated. While still in Guatemala, faculty and staff questioned people with symptoms about risk factors, onset of symptoms, severity, and followed with treatment and recovery tracking. Further, food and water safety was inspected throughout the week to ensure that this was not the source of the outbreak. Other groups staying at the same host organization were interviewed to identify illness. After returning to the United States, a brief survey was voluntarily completed by travelers.

Results

The first symptoms occurred on Monday and were reported by one traveler with vomiting and diarrhea, which improved after a few hours. This case reported having brushed their teeth with unfiltered water. No other symptoms were reported until Tuesday when a traveler became very ill with vomiting, diarrhea, and fever. By Wednesday morning, six people were severely ill, unable to eat or drink, febrile, and experiencing profuse diarrhea. Others had less severe symptoms. The number of people with symptoms increased rapidly throughout the trip. The index patient who became ill on Tuesday had seen a patient in clinic on Monday with similar symptoms.

Other traveling groups staying at the host organization were questioned and only one case of illness was identified outside of the medical group (including community members). One volunteer with another group shadowed a physician in clinics with the medical group on Thursday and became ill with the same symptoms by Saturday morning. This helped to establish an approximate 24-36 hour incubation period.

Observations during clinic on Thursday included that students were not practicing hand washing before and after each patient and were not drinking adequate amounts of filtered water. Because of these findings, the established incubation period, and an adequate kitchen inspection, it was determined that the illness was likely being spread from person to person within the group and had probably been acquired initially from another sick person (likely a patient).

Because the traveling group was medical, several licensed physicians provided medical care to the ill members. One patient was treated with ciprofloxacin on Wednesday, and was observed to improve faster than the others. Because of this observation and the severity of

symptoms, ill travelers were subsequently treated with Cipro as well. Because those treated with Cipro recovered faster, a bacterial infectious agent was likely the cause.

The survey administered after returning to the U.S. was voluntarily and confidentially completed online by 69 of the 93 medical travelers. The results concluded that a total of 49 of the respondents (74%) reported symptoms either during or after the trip (or both). Those who became ill were all working together in the clinic and spending day and night hours in the group. There was no correlation to reported consumption of food or water. Despite the outbreak, only one traveler reported that they would not travel with the group again.

Conclusions

Due to the marked difference in illness incidence between the medical team and community travelers, investigating the outbreak was important. Food and water safety inspections and lack of correlation of symptoms to food or water consumption supported person-to-person transmission. The lack of illness in the public health professionals and in the 35 community travelers was likely due to them being involved in activities outside clinic and spending less time with the medical group. Observed poor hand hygiene practices likely contributed to the rapid spread. Good hand hygiene is the primary prevention method for communicable disease and should be emphasized on future trips and among traveling groups in general.

Limitations of the study include risk factors not addressed in the survey. For example, hand hygiene practices in those who had symptoms versus those who did not may have been helpful. However, self-report may not have been consistent with observed practices.

Further, preventative measures such as use of probiotics were not addressed and may be useful data for future investigations. A survey was developed for future use that inquires about more risk factors. Other limitations were those associated with self-report such as recall bias.

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Socioeconomic Status and Barriers Influencing Healthcare Access among Hispanics in Central Virginia.

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Abstract

Purpose:

Evidence shows that low-income populations often have poor health-related quality of life. Health disparities are even worse among minority populations. This study aims to increase understanding about socioeconomic determinants of health among Hispanics in Central Virginia to enable appropriate culturally-sensitive interventions by relevant stakeholders.

Methods:

Using a self-administered questionnaire, a cross-sectional survey of 100 participants from the Hispanic community in Central Virginia was done in April 2016. Research hypotheses were that socioeconomic status is a major determinant of access to healthcare, and that barriers to healthcare services influence preventive health behaviors in this population.

Results/Findings:

Chronic health conditions were the most commonly reported health problems. Among those who accessed preventative healthcare, a long waiting list and racial discrimination were problems most commonly encountered at health facilities. With almost two-thirds (64.2%) earning household income ≤$30,000, the cost of healthcare and lack of medical insurance were the major barriers to seeking healthcare. Household income was also a significant determinant of the type of health care facility accessed and other problems encountered.

Conclusion:

Multiple factors interact significantly as a blend of social determinants that can be targeted in interventions to improve the healthcare-seeking behavior and access to healthcare among this population.

Introduction and Purpose

Barriers to health care services are usually categorized into factors affecting availability, affordability, acceptability, and geographic accessibility of health care services (Marmot & Allen, 2014). Healthcare availability entails the existence of physical health systems, health workers, equipment, drugs, and the time a patient has to wait before receiving health services. Healthcare affordability is determined by cost, household income, and willingness to pay for services received (Mosadeghrad, 2014). Cultural norms, community preferences, and the attitudes of healthcare workers have been shown to influence the willingness of individuals (or groups) to utilize health services (Marmot & Allen, 2014; Mosadeghrad, 2014; Nobles et al., 2013). In addition, the location of a health center and transportation barriers may influence the decision to seek health services (Mosadeghrad, 2014; Nobles et al., 2013). These barriers are not mutually exclusive and interact with each other as the social determinants of health (Marmot & Allen, 2014). Although health disparities have a multifactorial etiology, socioeconomic disparity has been well established as a major determinant, perhaps, the single largest set of determinants of health utilization and outcomes (Marmot & Allen, 2014; Mosadeghrad, 2014).

Socioeconomic status is the social hierarchy of an individual or a group. It is predominantly derived from information on occupation, income, and educational level (Kim & Park, 2015). Individuals with low socioeconomic status have more health-related problems and worse self-perceived health (Marmot & Allen, 2014). Socioeconomic hierarchy underlies the differences in health behavior-associated risk factors such as

obesity, smoking, hypertension, and physical inactivity (Chen & Miller, 2013; Mielck et al., 2013). These interactions ultimately lead to a wide gap in life expectancy between both extremes of socioeconomic status (Marmot & Allen, 2014). Research has shown that members of some minority populations in the United States especially Hispanics and African Americans have disproportionately higher prevalence of both infectious and chronic diseases than whites (Kim and Park, 2015; Braveman & Gottlieb, 2014). A higher proportion of such minority groups live in areas with poor housing and high risks of environmental hazards than whites. Also, they have a larger proportion of people without college education, and hence at the lower end of the income scale.

Within the last two decades, the Hispanic population has been the principal driver of demographic growth in the United States. It is the most populous ethnic minority in the United States with an estimated 56 million people in 2014, and projected to reach 76 million by 2050 ("United States Quick Facts," 2017). Hispanics represent 18 percent of the total U. S. population and account for over one-quarter of the infant population ("United States Quick Facts," 2017). Although the Asian population had a growth rate of 3 percent in 2017, Hispanics were responsible for 56 percent of population growth in the United States between 2000 and 2010 ("United States Quick Facts," 2017; "Demographic Profile of Hispanics in Virginia," 2011; Passel et al., 2011). In 2016, the median annual household income among Hispanics in the United States was $47,000, compared to $68,000 among whites. In the same year, the poverty rate among Hispanics was 20 percent, compared to less than 9 percent among whites ("United States Quick Facts," 2017; Kuebler & Rugh, 2013). The National Health Insurance Survey conducted between January and June 2016 shows that one in four Hispanic adults aged 18 to 64 years was without health insurance. This was twice and three times the proportion in blacks and whites respectively ("Health Insurance Coverage," 2016).

Some factors affecting access to health care are specific to the Hispanic population in the United States including language barriers, immigration status and level of acculturation. Over 40 percent of Hispanics in the U. S. were born outside the country, and retain their health behaviors and cultural beliefs. Some studies suggest that less than one-fourth of Hispanics in the U.S. speak English proficiently (Morrison et al., 2014). Recent immigrants especially those who are undocumented and without proficiency in English are not likely to have employers offering health insurance as a benefit. In addition, many Hispanic children born in the United States to undocumented parents are not enrolled for Medicaid because of the fear of being discovered by immigration authorities. This combination of factors explains, in part, why among Hispanics, there is poor access to preventive healthcare with frequent emergency room visits (Morrison et al., 2014; Tienda & Mitchell, 2006). Also, perceived threats and barriers have been widely documented as predictors of health-related behaviors among Hispanics. Research shows that many Hispanic women believe that their susceptibility to diseases like breast cancer is largely dependent on divine predetermination. In addition, for some young Hispanic females, the embarrassment of admitting to sexual intercourse and the level of physical exposure during Pap smear for cervical cytology in cervical cancer screening are perceived barriers that prevent utilization of preventive health services (Byrd et al., 2004; Julinawati, 2013).

Besides the contributory role of intergenerational changes in health behavior among Hispanics living in traditional Hispanic settlements, there is little variation in the relationship between socioeconomic barriers and health outcomes among Hispanics in different regions of the United States (Rhodes et al., 2015; Vega et al., 2009). According to the United States Census Bureau, in 2016, the estimated population of Hispanics living in Virginia was 765,000 ("United States Quick Facts," 2017). While this number represents 9 percent of the state population, more than 21 percent of the uninsured in Virginia are Hispanics (Virginia Department of Health, 2016). The Pew Research Center estimates that

the median annual personal earning of Hispanics in Virginia is $26,000 compared to $38,000 in non-Hispanic whites. Also, home ownership rates are 45 percent and 73 percent among Hispanics and whites respectively ("Demographic profile of Hispanics in Virginia," 2011). The American Community Survey data for 2012 showed that although Hispanics constitute 5 percent of the population in the Richmond metropolitan area of Virginia, they are far more likely to live in poverty than other racial groups with 4 in 10 Hispanics living below the poverty line compared to 32 percent of blacks and 19 percent of whites. Also, 3 in 5 Hispanics in Richmond do not have a high school diploma and 4 in 5 are without a post-high school degree ("Health equity in Richmond, Virginia," 2017).

The rapidly expanding number of Hispanics in the United States justifies the need for their inclusion in health research at the state and county levels. With the exception of a few states like California, Arizona, and Texas, there is paucity of state-level socioeconomic and health data on Hispanics including in Virginia. This study sets out to improve the database of information on the socioeconomic barriers and health status of Hispanics in Central Virginia to enable appropriate culturally-sensitive interventions by relevant stakeholders.

Methods

This study was conducted using the cross-sectional survey study design research method. The cross-sectional survey approach is a type of observational study design that gave an overall picture in finding out the prevalence of healthcare needs for the Hispanic community in Central Virginia. This study involved one contact with the study population and was relatively inexpensive to undertake, which made it easier to discover the needs for the Hispanic people in an expedited fashion.

According to Setia (2016), cross-sectional study designs are useful for population-based surveys and to evaluate the prevalence of disease in clinic-based samples. The investigator measures the outcome and exposures in the study participants simultaneously. Due to the

study design being a one-time measurement of exposure and outcome, it is challenging to obtain the actual causal relationships from this cross-sectional analysis (Setia, 2016).

Research Hypotheses

1. Socioeconomic status is a major determinant of access to healthcare among Hispanics in Virginia.
2. Barriers to healthcare services influence preventive health behaviors among Hispanics in Virginia.

Participants

The inclusion criteria included 100 participants eighteen years and older of Hispanic origin. The participants were also of low socioeconomic status living within the area of Central Virginia in Campbell County, Bedford County, and Lynchburg City. After the participants have been selected for the study, the investigator follows the study to assess the exposure and the outcomes (Setia, 2016). The reason for this specified sampling was to focus on individuals within the Hispanic community with a true need for full access to healthcare that is affordable to meet their particular needs. The target was those under low socioeconomic status due to the lack of health clinics and healthcare access offered to them in the Central Virginia area.

Ethical Considerations: Institutional Review Board.

In order to conduct the study, Assessing the Health Need Among the Hispanic Community in Campbell County, Bedford County, and Lynchburg City by using human research participants, approval from the Institutional Review Board (IRB) was required along with the following supporting documents: consent forms and the health surveys/questionnaires. The approval exemption number provided for this study was

2785.040617 (see Appendix 1). An extensive application was submitted to IRB that included basic protocol information, other study material and considerations, purpose of research, participant inclusion/exclusion criteria, recruitment of participants, research procedures, data analysis, process of obtaining informed consent, waiver of signed informed consent document, participant privacy and confidentiality, and participant risks and benefits.

The required supporting documents with the IRB application included the health survey and the consent form.

Ethical Considerations: Consent Form.

The consent forms were written in both Spanish and English for those participants who solely spoke Spanish. The consent form explained the research study and provided background information, procedures, risks/benefits of being in the study, compensation, confidentiality, voluntary nature of the study, and contacts/questions. This form enabled each prospective participant to choose whether or not they wanted to participate in this study by defining the guidelines needed from each participant.

Ethical Considerations: Participant Privacy and Confidentiality.

During the administration of the surveys, no names were collected on the surveys or consent forms to protect the privacy of the participant and to keep recorded data confidential. Upon completion of the data collection, all collected data was stored in a locked file cabinet. while the only persons with permission to access the data were the researchers of this study. Once the three-year retention period expires, all data will be deleted and cross-shredded.

Survey/Questionnaires

The purpose of this study was to provide in-depth data about Hispanic participants' needs for quality access to affordable healthcare and healthcare programs. After IRB approval, ten students a part of the Spanish Medical Terminology class were given a total of three hundred needs assessment questionnaires distributed evenly to hand out to individuals of Hispanic origin in Campbell County, Bedford County, and Lynchburg City of Virginia. The students went to churches, Hispanic grocery stores, and Hispanic restaurants in order to find participants to complete the surveys. The surveys were self-administered with the response rate being one hundred out of three hundred.

Health Survey.

The surveys were written in both Spanish and English for those participants who solely spoke Spanish (see Appendix 1). Three hundred surveys were distributed to various Hispanic people throughout Central Virginia and one hundred were completed. The surveys consisted of twenty-five questions that inquired about each participant's sex, age, Hispanic origin, marital status, household information, employment status, annual salary, diet information, overall lifestyle information, primary care physician/health clinic information, and breastfeeding information.

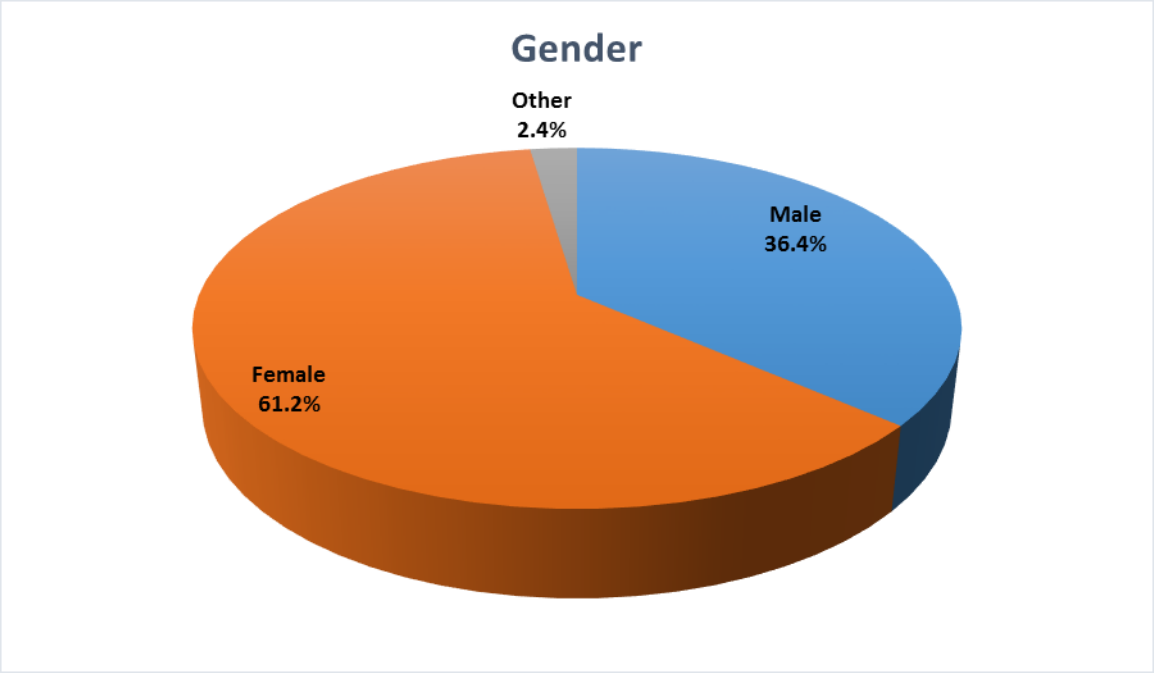
Statistical Analysis

The data was analyzed using IBM SPSS Version 23.0. The data analyzed included the participant's health status, healthcare status, mortgage status, household employment problems, and household income pertaining to healthcare. The dependent variables of this study are access to healthcare and preventative healthcare. The independent variable of this study are the barriers to healthcare.

Results

There were 100 study participants who completed the questionnaire and returned it to the researchers. As shown in Figure 1, out of 85 respondents who indicated their gender, majority (61.2%) were female, while two (2.4%) respondents selected “Other” as their gender.

Figure 1: Distribution of Respondents by Gender, Hispanic Needs Assessment Survey, Central Virginia, April 2017 (n=85)



Certain questions were skipped by some participants. The number of persons who answered “Yes” to each question or response option is presented in the table below, and the proportions who selected each response option per question are shown. For questions where the participants could answer “Yes” or “No” to multiple responses (or select all that apply), the number of persons who responded to each response

option is placed by the response option; while for questions with mutually exclusive response options, the number of participants who answered the question is indicated next to the criterion being assessed.

Table 1: Frequency distribution of participants' responses, Hispanic Needs Assessment Survey, Central Virginia, April 2017

Criterion	Frequency	Percent (%)
Health Problem(s) of Participants		
Cancer *(n=69)*	16	23.2
Diabetes *(n=69)*	16	23.2
Hypertension *(n=69)*	13	18.8
Overweight/Obesity *(n=69)*	13	18.8
Heart disease *(n=69)*	2	2.9
Vision problems *(n=69)*	18	26.1
Recurring headache *(n=69)*	21	30.4
Joint/back pain *(n=69)*	31	44.9
Hearing problems *(n=69)*	7	10.1
Respiratory problems *(n=69)*	9	13.0
Toothache/cavities *(n=69)*	6	8.7
HIV *(n=69)*	0	0
Other health problems *(n=69)*	9	13.0
Type of Preventative Healthcare Accessed		
Mammogram *(n=77)*	22	28.6
Pap smear *(n=77)*	12	15.6
Prostate cancer screening *(n=77)*	5	6.5
Flu shot *(n=77)*	12	15.6
Blood pressure check *(n=77)*	11	14.3
Physical exam *(n=77)*	26	33.8
Blood glucose check *(n=77)*	14	18.2
Cholesterol screening *(n=77)*	21	27.3
Vision screening *(n=77)*	26	33.8
Bone density screening *(n=76)*	3	3.9

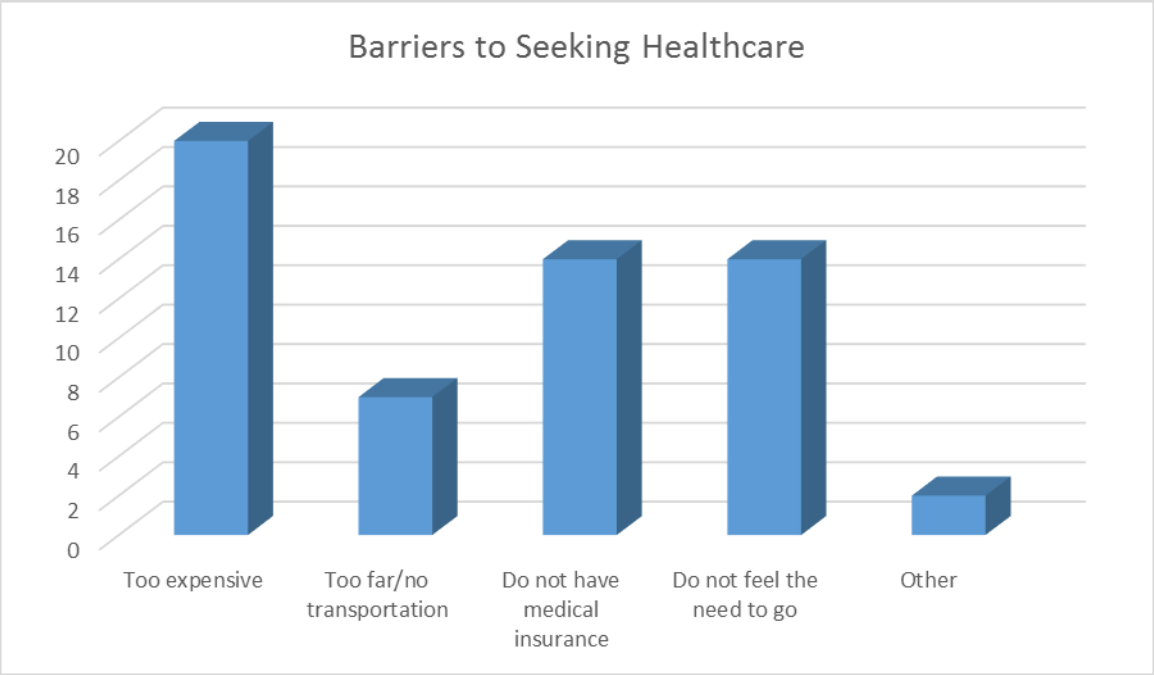
Dental screening and exam *(n=77)*	27	35.1
Other *(n=77)*	2	2.6
Healthcare Facility Accessed		
Physician's office *(n=94)*	38	40.4
Emergency room *(n=94)*	16	17.0
Family/friend *(n=94)*	9	9.6
Health department *(n=94)*	7	7.4
Urgent care clinic *(n=94)*	17	18.1
Nowhere *(n=94)*	10	10.6
Other *(n=93)*	4	4.3
Problems encountered at Healthcare Facility		
A long waiting list *(n=51)*	13	25.5
Racial discrimination *(n=51)*	12	23.5
Refusal to accept Medicaid *(n=51)*	9	17.6
Difficulty with transportation *(n=51)*	3	5.9
Lack of mental health services *(n=51)*	0	0
Could not find a free clinic *(n=51)*	6	11.8
Not having the right equipment/specialists *(n=51)*	2	3.9
Discrimination based on income *(n=51)*	3	5.9
Discrimination based on not having insurance *(n=51)*	7	13.7
No translator for appointments *(n=51)*	2	3.9
Could not afford the care *(n=51)*	4	7.8
Did not know how to use my health insurance *(n=51)*	0	0
Barriers to Seeking Healthcare		
Too expensive *(n=48)*	20	41.7
Too far/no transportation *(n=48)*	7	14.6
Do not have medical insurance *(n=48)*	14	29.2
Do not feel the need to go *(n=48)*	14	29.2
Other *(n=48)*	2	4.2

Mortgage Foreclosure Problems		
Not enough income to pay mortgage *(n=38)*	9	23.7
Problems with mortgage company's records *(n=38)*	17	44.7
No notice from mortgage company of a problem or a change in policy *(n=38)*	8	21.1
Mortgage company refused to modify the mortgage *(n=38)*	2	5.3
Other *(n=38)*	2	5.3
Household Employment Problems		
Inability to get work following suspension of driver's license due to unpaid fines *(n=41)*	19	46.3
Inability to get work following suspension of driver's license due to DUI *(n=41)*	5	12.2
Being denied a job, raise or promotion due to discrimination *(n=41)*	3	7.3
No accommodation for disability *(n=41)*	4	9.8
Not being paid the correct amount *(n=41)*	2	4.9
Other *(n=41)*	2	4.9
Multiple problems *(n=41)*	6	14.6

As seen in Table 1, out of 97 respondents, 28 reported that they did not currently have any health problems. Among the 69 who did have health problems, the most common condition reported was joint /back pain (44.9%), while recurring headache (30.4%) and vision problems (26.1%) were next. Among 97 respondents, 20 reported that they do not have access to preventative care. Of those who accessed preventative healthcare, the procedure most often accessed was dental screening and exam (35.1%), with physical exam and vision screening tied at second place (33.8%). Majority of the respondents (40.4%) access healthcare at a physician's office, while 18.1% access healthcare at an urgent care clinic. However, 10.6% of them do not have a regular place where they access healthcare.

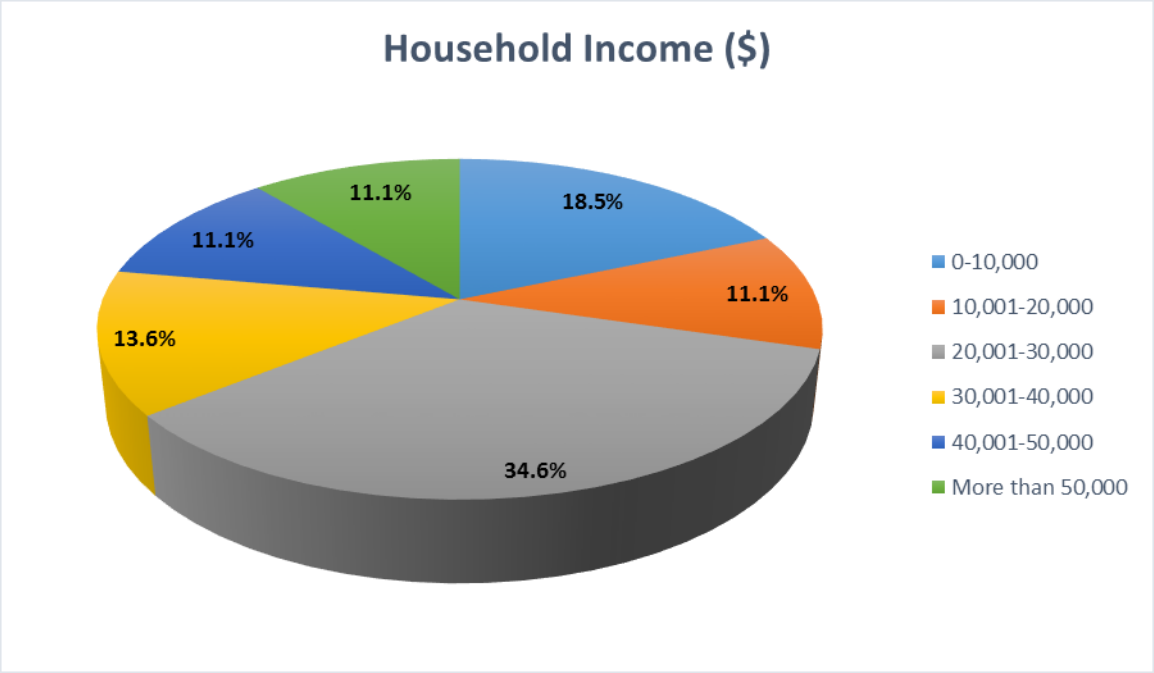
Out of 94 respondents, 43 (45.7%) said they do not have any problems with accessing routine healthcare, while the remaining 51 respondents, as seen in Table 1, cited a long waiting list (25.5%) and racial discrimination (23.5%) as the two most common problems they experience at a healthcare facility (Table). Forty (45.5%) out of 88 respondents said they did not experience any barriers to seeking healthcare; whereas, as Figure 2 shows, 20 respondents (41.7%) reported that the cost of healthcare was the most significant factor serving as a barrier to seeking healthcare, with lack of medical insurance and poor perception of the necessity to seek healthcare tying as the next most reported barriers (29.2%).

Figure 2: Barriers to Seeking Healthcare, Hispanic Needs Assessment Survey, Central Virginia, April 2017 (n=48)



As Figure 3 shows, only 81 respondents reported their annual household income, of which the majority (34.6%) earn $20,001-$30,000 annually. The next most common household income level (18.5%) was for those who earned $0-$10,000 annually. For third place (11.1%), household incomes of $10,001-$20,000, $40,000-$50,000, and more than $50,000 all tied. The median household annual income was among who earned $20,001 - $30,000.

Figure 3: Household Annual Income, Hispanic Needs Assessment Survey, Central Virginia, April 2017 (n=81)



Forty-nine (56.3%) out of 87 participants said they do not have any mortgage foreclosure problems. Table 1 shows that out of the 38 respondents who reported mortgage foreclosure problems, the issue most reported was problems with the mortgage company's records (44.7%); second to this was inadequate income to pay mortgage (23.7%). Forty-seven (53.4%) out of 88 respondents reported that they do not

have any household employment problems; whereas, as seen in Table 1, of the 41 respondents who had household employment problems, the most common problem encountered (46.3%) was the inability to get a job due to suspension of their driver's license that resulted from unpaid fines.

Chi-Square Analysis

On Chi-square analysis, as seen in Table 2, there was statistically significant evidence at $\alpha = 0.05$ to show that household employment problems varied by gender ($\chi^2 = 38.930$; $p = 0.028$; $df = 14$). However, mortgage foreclosure problems did not vary by gender ($p = 0.503$). As seen in Table 3, there was statistically significant evidence at $\alpha = 0.05$ to show that the healthcare facility accessed varied by household income level ($\chi^2 = 81.622$; $p = 0.002$; $df = 35$). However, health status did not vary by household income level ($p = 0.165$), nor did type of preventative care accessed vary by household income ($p = 0.429$).

Furthermore, there was statistically significant evidence at $\alpha = 0.05$ that problems encountered at healthcare place varied by household income level ($\chi^2 = 105.011$; $p = 0.007$; $df = 55$). In addition, there was statistically significant evidence at $\alpha = 0.05$ that barriers to seeking healthcare varied by household income level ($\chi^2 = 64.549$; $p = 0.002$; $df = 25$).

Table 2: Household Employment Problems by Gender, Hispanic Needs Assessment Survey, Central Virginia, April 2017

Gender	Household Employment Problems								Total
	No problems with employment	Unable to get to work due to suspended driver's license caused by unpaid fines	Unable to get to work due to suspended driver's license caused by DUI	Being denied a job, raise or promotion due to discrimination	No accommodation for disability	Not being paid the correct amount	Other	Multiple problems	
Male	15	5	0	2	2	0	1	2	**27**
Female	27	10	4	1	2	1	1	2	**48**
Other	0	1	0	0	0	1	0	0	**2**
Total	**42**	**16**	**4**	**3**	**4**	**2**	**2**	**4**	**77**

Pearson Chi-square (χ^2) = 38.930; p = 0.028; df = 14

Table 3: Healthcare Facility Accessed by Household Income Level, Hispanic Needs Assessment Survey, Central Virginia, April 2017

Household Income	Healthcare Facility								Total
	Physician's Office	Emergency Room	Family/Friend	Other	Health Department	Urgent care clinic	Nowhere	Multiple places	
0-10,000	5	1	0	1	3	2	1	2	15
10,001-20,000	3	0	1	0	0	3	2	0	9
20,001-30,000	9	12	4	0	0	1	2	0	28
30,001-40,000	4	0	1	1	1	3	0	1	11
40,001-50,000	2	0	1	1	0	3	0	1	8
More than 50,000	5	0	1	0	1	0	1	1	9
Total	28	13	8	3	5	12	6	5	80

Pearson Chi-square (χ^2)=81.622; p=0.002; df=35

Household income	Problems encountered at healthcare facility												Total
	No routine problems	Long waiting list	Discrimination for lack of insurance	Lack of translator	Could not afford	Multiple problems	Racial discrimination	Refusal to accept Medicaid	Transportation difficulty	Could not find a free clinic	Not having the right equipment / specialist	Discrimination based on income	
0-10,000	9	0	0	1	1	2	1	0	1	0	0	0	15
10,001-20,000	5	0	0	0	0	0	1	1	0	2	0	0	9
20,001-30,000	6	4	2	0	1	1	7	6	0	0	0	1	28
30,001-40,000	4	4	2	0	0	0	1	0	0	0	0	0	11
40,001-50,000	6	1	0	0	0	0	0	0	0	1	1	0	9
More than 50,000	5	1	1	0	0	0	1	0	0	1	0	0	9
Total	35	10	5	1	2	3	11	7	1	4	1	1	81

Table 4: Problems encountered at Healthcare Facility by Household Income Level, Hispanic Needs Assessment Survey, Central Virginia, April 2017

Pearson Chi-square (χ^2) = 105.011; p = 0.007; df = 55.

Table 5: Barriers to seeking Healthcare by Household Income Level, Hispanic Needs Assessment Survey, Central Virginia, April 2017

Household Income	Barrier to seeking Healthcare						Total
	No problems getting preventative care	Too expensive	Too far/no transportation	I don't have medical insurance	I don't feel like I need to go	Multiple problems	
0-10,000	2	3	0	3	4	3	15
10,001-20,000	5	1	0	1	1	1	9
20,001-30,000	15	6	3	2	1	1	28
30,001-40,000	5	3	0	0	3	0	11
40,001-50,000	4	0	0	3	0	1	8
More than 50,000	4	1	1	1	1	0	8
Total	35	14	4	10	10	6	79

Pearson Chi-square (χ^2) = 64.549; p = 0.002; df = 25

Discussion

The multiple barriers to healthcare among Hispanics in Central Virginia are brought to fore by this study. Findings agree with multiple studies that identify factors affecting availability, acceptability, and geographic accessibility as barriers to accessing healthcare (Marmot & Allen, 2014; Mosadeghrad, 2014; Nobles et al., 2013). It is also obvious from our findings that these factors are not independent of one another. They interact significantly as a milieu of social determinants that influence the healthcare-seeking behavior and access to healthcare among this population.

There was wide variation in the household income of the respondents. Though slightly more than one-third of them earn $20,001 - $30,000 annually, the second largest proportion (almost 20%) earn $10,000 or less per year, and are classified as low-income earners. Almost two-thirds (64.2%) of the respondents earn an annual household income of $30,000 or less, compared to 50.9% of all U.S. Hispanics and 26.3%

of non-Hispanic families who earn less than $35,000 per year (Rodriguez et al., 2014). In addition, of all racial and ethnic groups in the U.S., Hispanics are reported to have the lowest median annual earnings (Rodriguez et al., 2014). The upper value of the median category of household income reported in this study is less than two-thirds of the median annual household income of a Hispanic household in the United States in 2016 as reported by the United States Census Bureau, while it is less half of the median household income reported for whites that year (2017).

Economic disparity alone could significantly influence the ability of Hispanics to access healthcare (Marmot & Allen, 2014). Our findings show that household income level was a major determinant of the type of healthcare facility accessed. For those who were unable to access any form of healthcare, a lack of motivation to seek healthcare was as important as a lack of medical insurance in preventing them from seeking healthcare. Moreover, seeing that almost one-third of the respondents that experience barriers to seeking healthcare report that they lack medical insurance corroborates the finding of the National Health Insurance Survey (2016) and the Virginia Health Equity Report (Virginia Department of Health, 2016). Annual household income also significantly influenced barriers to seeking healthcare such as the cost of healthcare, the availability of transportation to a healthcare facility, motivation to seek healthcare when ill, and availability of medical insurance. However, it is noteworthy that household income did not influence the type of preventative care accessed among respondents who go to a healthcare facility. Apparently, choosing to go to a healthcare facility is accompanied by a resolve to access any forms of preventative care deemed necessary, without regard to how expensive they are.

About 45% of the respondents reported that they do not experience any barriers to seeking healthcare and do not encounter any problems at the healthcare facility. This may be the same category of respondents as those that do not experience any mortgage foreclosure

problems or any household employment problems; and perhaps the same group as those who earn higher annual household incomes. This study did not determine whether any correlation existed between these groups of respondents, but it is worthy of note that almost the same number of respondents fall within these categories. However, it is likely that this finding may not be generalizable to the population of Hispanics in Central Virginia, as other studies report that much smaller proportions that do not experience barriers to healthcare (Marmot & Allen, 2014; Mosadeghrad, 2014; Nobles et al., 2014).

Among the respondents that do access a healthcare facility, a long waiting list (25.5%) and racial discrimination (23.5%) top the list of problems encountered at the healthcare facility – factors that may deter the respondents from seeking healthcare anymore, or from visiting that same facility. Refusal to accept Medicaid and discrimination because they do not have medical insurance also stood out among problems preventing access to services at the healthcare facility. Meanwhile, only a small proportion (3.9%) cited the lack of a translator for appointments as a problem they encountered, a pointer that language barriers or level of acculturation may not be significant factors preventing access to healthcare among them (Morrison et al., 2014; Tienda & Mitchell, 2006). However, it is also possible that majority of those who access healthcare facilities go there with a friend or family member who is fluent in the English language and could serve as an interpreter for them. In addition, only 7.8% reported that they could not afford the care while they were at the healthcare facility and just 11.8% reported that being unable to find a free clinic prevented them from accessing healthcare services – further indicating that majority of those who make the decision to go to a healthcare facility either have some form of medical insurance or can afford to pay for the services provided.

The most commonly accessed form of preventative care was dental screening and exam (35.1%), while only 8.7% of the respondents had toothache/cavities. This may be a pointer to the protective effect of accessing preventative care. In addition, there may be an association between the report of physical exam and vision screening as the next most common forms of preventative care accessed and the occurrence of joint/back pain, recurring headache, and vision problems as the three most common health conditions the respondents said they had. Furthermore, because these forms of preventative care require highly skilled healthcare personnel, this may explain why the most common type of healthcare facility visited was a physician's office. However, emergency rooms and urgent care clinics are also visited quite frequently, indicating that a significant proportion of them would rather wait till their health conditions become much worse before accessing a healthcare facility.

Among other barriers to seeking healthcare, having a healthcare facility located too far or lacking transportation to the facility was only reported by a small proportion of the respondents. This contrasts the findings from other studies that cite this as a major barrier to seeking healthcare (Mosadeghrad, 2014; Nobles et al., 2013). In addition, while other studies report some correlation between one's socioeconomic status and one's self-perceived health status—with people of lower socioeconomic status being more likely to perceive themselves as having worse health—the current study does not show this association perhaps because we only asked about one component of socioeconomic status—income—and not for occupation and educational level (Marmot & Allen, 2014; Nobles et al., 2013; Kim & Park, 2015).

Though majority of the health conditions we asked about were chronic conditions, and as anticipated, at least 20% of the respondents reported having diabetes, vision problems, and joint/back pain, it was surprising to find that only 2.9% of the respondents reported having heart

disease while 23.2% reported having cancer (Kim & Park, 2015; Chen & Miller, 2013). This contrasts evidence, which shows that cardiovascular disease is the chief cause of mortality among U.S. Hispanics (Rodriguez et al., 2014). This is true especially among the Mexican Hispanics (who are the most studied population of Hispanics in the U.S.), who have a cardiovascular disease prevalence of 33.4% among males and 30.7% among females (Rodriguez et al., 2014). The low self-reported prevalence of heart disease in the study group may be linked to their poor health-seeking behavior and poor access to healthcare, leading to fewer opportunities for diagnosis of heart disease particularly in the early stages before life-threatening complications set in. On the other hand, cancer—which is often perceived as more life-threatening than other health conditions—may cause them to report early to a healthcare facility for screening and diagnosis, particularly if they have had friends or family members who died from cancer.

Summary and Conclusions

We administered three hundred surveys and only received one hundred. The feedback from most of the Hispanic participants was fear of immigration and the fear of people knowing their medical problems. In addition, the participants did not like that the questionnaire asked too many extensive questions and was very long in length. After knowing the fears of the participants, this study has illustrated what the health needs are in the Central Virginia Hispanic population and how to better address them in the future. On the other hand, we did notice that some of the questions in the questionnaire were not answered, which could be attributed to their fears of immigration, the potential of other people discovering participant's medical problems, and the fact that the questionnaire was too long.

Recommendations

In creating a new questionnaire for the Central Virginia Hispanic population, we will aim to decrease the number of questions in the questionnaire, increase participation and our sample size. We will also ensure that incentives will be given to motivate more participation. On the contrary, since the study did show some health barriers in the Hispanic population, the appropriate stakeholders can now address them to make necessary changes. Lastly, we will target our questions towards healthcare, healthcare access, and socioeconomic barriers instead of immigration and household status. The new questionnaire will also address other Hispanic populated areas in Virginia and not just the Central area of Virginia.

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Monitoring outdoor tobacco policies of Virginia colleges: A descriptive analysis.

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Abstract

Purpose: The purpose of this study was to monitor current outdoor tobacco policies of colleges within the state of Virginia.

Methods: The tobacco policies of 2-year public colleges, 4-year public colleges, and 4-year private non-profit colleges in Virginia were located online. The policies were then categorized according to the types of tobacco products that were prohibited (Smoking Policies, Tobacco Policies, and E-cigarette Policies) and where those products were prohibited outdoors (No Policy, Entrance Policy, Perimeter Policy, Designated Smoking Areas Policy, All Grounds Policy).

Findings: From a final sample of 62 college policies, 2 (3%) had No Policy, 29 (47%) had an Entrance Policy, 12 (19%) had a Perimeter Policy, 10 (16%) had a Designated Smoking Areas Policy, and 9 (15%) had an All Grounds Policy.

Conclusions: The far majority of colleges do not meet national recommendations for outdoor tobacco policies. Practical implications and suggestions for future research are discussed in the article.

Introduction

Tobacco use on college campuses is an important public health issue. Various studies suggest that anywhere from 11% to 34% of college students who smoke were enrolled in college when they initiated smoking (Bernat, Klein, & Forster, 2012; Choi, Harris, Okuyemi, & Ahluwalia, 2003; Everett, Husten, Kann, Warren, Sharp, & Crossett, 1999; Tercyak, Rodriguez, & Audrain-McGovern, 2007; Wechsler, Rigotti, Gledhill-Hoyt, & Lee, 1998; Wetter, Kenford, Welsch, Smith, Fouladi, Fiore, & Baker, 2004). According to the National College Health Assessment, the nation's college students are current users of several types of tobacco, including cigarettes (9.7%), electronic cigarettes (e-cigarettes) (4.9%), hookah (4.6%), cigars, little cigars or cloves (4.4%), and smokeless tobacco (2.5%) (American College Health Association, 2016). Both qualitative (Cho & DeVaney, 2010; Seitz, Strack, Rice, DuVall, Moore, & Wyrick, 2012) and quantitative (Fallin, Roditis, & Glantz, 2015; Lechner, Meier, Miller, Wiener, & Fils-Aime, 2012; Mason, Lust, Sanem, Golden, Kingsbury, & Rudie 2014) research findings indicate that secondhand smoke exposure is also a problem outdoors at colleges that do not have strict tobacco policies. For example, in one study, 45% of students reported that secondhand smoke was difficult to avoid while outdoors on campus (Mishra, Thind, Gokarakonda, Lartey, Watkins, & Chahal, 2011). Likewise, from a separate study, 77% of students reported being bothered by outdoor secondhand smoke (Garg, Fradkin, Moskowitz, 2011).

Due to the negative health effects of tobacco use, the American College Health Association, the American Lung Association, and the U.S. Department of Health and Human Services' Tobacco-Free College Campus Initiative recommend that colleges implement policies that prohibit the use of all types of tobacco products, as well as e-cigarettes, on all campus grounds, including the outdoors (American College Health Association, 2012; American Lung

Association, 2017; Tobacco-Free College Campus Initiative, 2017). The peer-reviewed literature supports this recommendation, as findings indicate that campus-wide policies are associated with decreased secondhand smoke exposure (Fallin et al., 2015; Figueroa & Wolfersteig, 2014; Lechner et al., 2012; Lee, Ranney, & Goldstein, 2013; Mason et al., 2014), positive changes in tobacco use behavior (Czart, Pacula, Chaloupka, & Wechsler, 2001; Lechner et al., 2012; Mason et al., 2014; Meier, Lechner, Miller, & Wiener, 2013; Seo et al., 2011),

improved attitudes and beliefs among students about tobacco (Lechner et al., 2012; Seo, Macy, Torabi, & Middlestadt, 2011), and positive attitudes towards tobacco-free campus policies (Fallin et al., 2015; Lechner et al., 2012; Seo et al., 2011).

Given the effectiveness of outdoor campus tobacco policies, it is important to maintain a detailed surveillance of these policies. The World Health Organization recommends that public health professionals utilize the MPOWER strategy for tobacco control, in which the "M" of the mnemonic represents "monitor tobacco use and prevention policies" (World Health Organization, 2017). Specifically, by monitoring outdoor college campus tobacco policies, health professionals can determine strengths and needs of policies, as well as improvements over time.

Currently, the American Lung Association and the Americans for Nonsmokers' Rights monitor which colleges in the United States have tobacco-free outdoor policies. Unfortunately, these organizations only list colleges that are completely smoke-free or tobacco-free outdoors, without monitoring colleges that have other types of outdoor tobacco policies (American Nonsmokers' Rights Foundation, 2017). By simply tallying the number of tobacco-free colleges, the American Lung Association and the Americans for Nonsmokers' Rights are not monitoring the complete range of policy types among colleges. For example, research indicates that common outdoor tobacco policies include prohibiting tobacco use: a certain distance from building entrances, a certain distance from building perimeters, on the entire campus except for designated smoking areas, or prohibiting smoking on the entire campus (Fallin-Bennett, Roditis, & Glantz, 2017; Lee et al., 2013; Seitz et al., 2012).

Therefore, the purpose of the study described in this article was to collect and analyze the current outdoor tobacco policies of the state of Virginia's colleges. Specifically, we focused on 2-year public colleges, 4-year public colleges, and 4-year private non-profit colleges.

Methods-Data Collection

Prior to conducting the study, the Institutional Review Board determined that the study was exempt, since all policies retrieved were freely available online and data was not collected from human participants.

During March of 2017, the government's National Center for Education Statistics' "College Navigator" website (http://nces.ed.gov/collegenavigator/) was used to locate Virginia's 2-year public colleges, 4-year public colleges, and 4-year private non-profit colleges. College Navigator gives users the option to filter colleges based upon state location, public or private college status, and length of degree options (e.g., 4-year degree, 2-year degree) (National Center for Education Statistics, 2017).

From College Navigator, we included every 2-year public college, 4-year public college, and 4-year private non-profit college from Virginia. We only included these colleges, since in 2014, of all 481,768 undergraduate students in Virginia, 92% were enrolled in 2-year public colleges, 4-year public colleges, and 4-year private non-profit colleges (National Center for Education Statistics, 2015). We excluded colleges that did not have a physical campus (i.e., online colleges) or that did not list student enrollment. In an electronic document, we copied and pasted each college's name, website hyperlink, and student enrollment. We then used the search pane of each college's website using a combination of the following terms: smoking, tobacco, policy. If the website did not produce the college's tobacco policy, we used the same search terms on the Human Resources webpage, policy listing webpage, and the most current student and faculty handbooks.

Tobacco policies were copied and pasted into an electronic document for analysis. If we were unable to locate the tobacco policy, it was listed as "not available" in the study's results, since it was assumed that if members of a college community could not easily locate a tobacco policy on the internet, then they might not contact administrators to determine the official campus tobacco policy.

Analysis

The outdoor policies were categorized based on the types of tobacco products being prohibited, including smoking policies, tobacco policies, and/or e-cigarette policies. Policies were categorized as "Smoking Policy" if the wording included "smoking" in general or more specific wording against all types of burning tobacco, such as cigarettes, cigars, cigarillos, cloves, hookah, and so on. Policies were categorized as "Tobacco Policy" if the wording was clear that "tobacco" included smoking and smokeless products, such as chew, dip, or snus. Policies were categorized as "E-cigarette Policy" if the wording was specific against e-cigarettes, vapes, or non-FDA approved products that mimic smoking.

The outdoor policies were further categorized based upon where smoking or tobacco use was prohibited on campus as follows: “No Policy” (did not prohibit smoking anywhere outdoors), “Entrance Policy” (prohibited smoking/tobacco use a certain distance from building entrances), “Perimeter Policy” (prohibited smoking/tobacco use a certain distance from the perimeter of buildings), “Designated Smoking Areas Policy” (prohibited smoking/tobacco use everywhere except for a number of designated areas), and “All Grounds Policy” (prohibited smoking/tobacco use everywhere outdoors).

Results

There was a total of 70 colleges filtered from the College Navigator website. Of those, we could not locate the tobacco policy of 7 colleges and there was 1 college that did not provide student enrollment, giving us a final sample of 62 colleges. There were 22 (35%) 2-year public colleges, 14 (23%) 4-year public colleges, and 26 (42%) 4-year private non-profit colleges.

The colleges had a variety of outdoor policies that prohibited a range of tobacco products (Table 1). There were 2 (3%) colleges that did not prohibit tobacco use outdoors. Of the remaining 60 colleges, 29 (47%) colleges (with a total enrollment of 341,606 students) had an Entrance Policy, ranging from 20 feet to 100 feet (Mdn = 25 feet). There were 12 (19%) colleges (with a total enrollment of 26,801 students) that had a Perimeter Policy, which ranged from 25 feet to 50 feet (Mdn = 25 feet). There were 10 (16%) colleges (with a total enrollment of 33,132 students) that had a Designated Smoking Areas Policy, which ranged from 4 designated areas to 13 designated areas. However, it should be noted that 6 of the colleges did not specify the number of designated areas. Finally, there were 9 (15%) colleges (with a total enrollment of 28,749 students) that had an All Grounds Policy.

The college policies prohibited different types of tobacco products (Table 1). From the sample of college policies, 16 (26%) had a Smoking Policy, 22 (35%) had a Smoking Policy and E-cigarette Policy, 9 (15%) had a Tobacco Policy, and 13 (21%) had a Tobacco Policy and E-cigarette Policy.

Discussion

The purpose of this study was to monitor the outdoor tobacco policies of Virginia colleges. Using the College Navigator website, we were able to locate each 2-year public, 4-year public, and 4-year private non-profit colleges in Virginia. From this, we assessed outdoor tobacco policies by searching the colleges' websites. Overall, the findings indicate that very few of Virginia's colleges are meeting national recommendations. It is important to reflect on these findings and discuss the implications for practice and future research.

There is a gap between the American College Health Association's recommended outdoor tobacco policies at colleges and the policies currently implemented at Virginia colleges. To date, only nine (15%) colleges in Virginia implement an All Grounds Policy. However, only two of those fully implemented the policy recommendations given by the American College Health Association by including smokeless tobacco and e-cigarettes as a prohibited products. To better serve the students attending Virginia colleges with an All Grounds Policy, campus administrators should consider prohibiting all types of tobacco products.

Unfortunately, most colleges in Virginia implemented tobacco policies that are often associated with non-compliance. Specifically, there were a total of 41 (68%) Virginia colleges (with a total enrollment of 368,407 students) that had an Entrance Policy or Perimeter Policy. While these types of policies seem logical to help prevent second-hand smoke exposure, several studies have indicated that smokers on college campuses do not comply with these types of policies (Amerando, Becker, & Johnson, 2010; Cho & DeVaney, 2010; Harris, Stearns, Kovach, & Harrar, 2009; Lee, Ranney, & Goldstein, 2013; Seitz et al., 2012). For example, Amerando and colleagues (2010) surveyed the compliance of 102 smokers of students, faculty of a policy that prohibited smoking 25-feet away from college building perimeters. They found that 50% of smokers complied with the policy "none of the time," 40% complied "some of the time," and only 10% complied "all of the time" (Amerando et al., 2010). In a different study, Harris and colleagues (2009) observed 265 smokers on campus during a one-week period, finding that only 88 (33%) complied with the policy.

Given the growing popularity and public health concern of e-cigarettes, it is important to discuss e-cigarettes in college tobacco policies. Our study found that 35 (56%) policies included e-cigarettes as a prohibited product. The vapors from e-cigarettes contain several potentially harmful chemical agents, traces of carcinogens, and addicting levels of nicotine (U.S. Department of Health and Human Services, 2016). According to the 2015 Youth Risk Behavioral Survey, 24% of high school students were current users of e-cigarettes (Kann et al., 2016), which is a 900% increase since 2011 (U.S. Department of Health and Human Services, 2016). The prevalence of e-cigarette use among these age groups resulted in a major report and call to action from the United States' Surgeon General (U.S. Department of Health and Human Services, 2016). By prohibiting e-cigarettes on campus, administrators can help to prevent use of this product as high school students make the transition to college.

Limitations

There were several limitations to our study. First, our search terms may not have resulted in finding the colleges policies, resulting in a lower sample size. Second, the colleges' publicly displayed tobacco policies may not have been up to date. Third, we did not include two-year for-profit colleges and four-year for-profit colleges, since the enrollment of these institutions makes up a small percentage of overall college students; however, by excluding these colleges, our findings cannot be generalized to all types of institutions.

Recommendations

We recommend that public health professionals in the state of Virginia advocate to legislators for a state-wide policy that would require all colleges to become tobacco-free. For example, the states of Arkansas, Illinois, Iowa, and Louisiana have implemented state-wide policies that prohibit tobacco products at state public colleges (American Nonsmokers' Rights Foundation, 2017). Ultimately, the implementation of such a policy would create a healthier learning environment, in which there would be a decrease in secondhand smoke exposure of over 400,000 students in the state.

As mentioned previously, organizations like Americans for Nonsmokers' Rights keep a count of colleges with completely tobacco-free outdoor policies; however, there is a lack of monitoring for other types of outdoor tobacco policies (e.g., No Policy, Entrance Policy, Perimeter Policy, Designated Smoking Areas Policy). In the spirit of the World Health Organization's MPOWER strategy, there should be monitoring for each type of campus tobacco policies on an ongoing basis, as this would allow health professionals to better gauge the strengths and needs of policies over the span of time. As such, future research should continue to monitor the outdoor tobacco policies of college campuses.

Table 1. Frequency of various tobacco policies implemented at colleges in Virginia

Type of policy	Entrances (%)	Perimeters (%)	Designated Areas (%)	All Grounds (%)
S	10 (16)	4 (6)	2 (3)	0 (0)
S & E	14 (23)	4 (6)	4 (6)	0 (0)
T	0 (0)	1 (2)	1 (2)	7 (11)
T & E	5 (8)	3 (5)	3 (5)	2 (3)

Note. S = Smoking Policy; T = Tobacco Policy; E = E-cigarette Policy

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